c.2

INSTRUCTION MANUAL

MODEL 6147

Universal EPUT® & Timer

67-02-20-09

MSFN
REFERENCE COPY
RETURN TO MSFN LIBRARY
GODD RD SPACE FLIGHT CENTE

Beckman® INSTRUMENTS, INC.

BERKELEY DIVISION
2200 Wright Avenue
Richmond, California

November 1963

WARRANTY

Instruments sold by Berkeley Division, Beckman Instruments, Inc., (hereafter called "the Company") are warranted only as stated below.

Subject to the exceptions and upon the conditions specified below, the Company agrees to correct, either by repair, or, at its election, by replacement, any defect of material or workmanship which develops within one year after delivery of the instrument to the original purchaser by the Company or by an authorized representative, provided that investigation and factory inspection by the Company discloses that such defect developed under normal and proper use.

The exceptions and conditions mentioned above are the following:

(a) Some components and accessories by their nature are not intended to, and will not, function one year. If any such component or accessory manufactured by the Company and part of the item sold fails to give reasonable service for a reasonable period of time, the Company will, at its election, replace or repair such component or accessory. What constitutes reasonable service and what constitutes a reasonable period of time shall be determined solely by the Company after the Company is in posession of all the facts concerning operating conditions and other pertinent factors and after such component or accessory has been returned to the Company, transportation prepaid.

(b) All instruments claimed defective must be returned to the Company, transportation charges prepaid, and will be returned to the customer with the transportation charges collect, unless the item is found to be defective in which case the Company will pay all transportation charges.

(c) The Company makes no warranty concerning components or accessories not manufactured by it, such as tubes, fuses, batteries, etc. However, in the event of the failure of any component or accessory not manufactured by the Company, the Company will give reasonable assistance to the purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in the light of the manufacturer's own warranty.

(d) Except as stated above, the Company makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except to the extent stated above, the Company shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise.

(e) The Company expressly disclaims any liability to its customers, dealers, and to users of its products, and to any other person or persons for consequential damages of any kind and from any cause whatsoever arising out of or in any way connected with the manufacture, sale, repair, replacement of, or arising out of or in any way connected with the use of any of its products.

(f) Representations and warranties made by any person, including representatives of the Company, which are inconsistent or in conflict with the terms of this warranty (including but not limited to the limitation of the liability of the Company as set forth above) shall not be binding upon the Company unless reduced to writing and approved by an officer of the Company.

(g) This warranty shall be governed by the laws of the State of California.

Claims for damage in shipment should be filed promptly with the transportation company.

All correspondence concerning the instrument should specify the model and serial number. This information appears on the company name plate. Any inquiry concerning details of operation, possible modifications, etc., should be addressed to the Sales Department, Berkeley division of Beckman Instruments, Inc., Richmond 4, California.

REPAIR SERVICE

Experienced service personnel and special test equipment are available at the factory to perform any necessary repairs. Every effort will be made to expedite the repair of instruments returned for servicing. Repair work will be performed only upon receipt of a written purchase order or authorization. Instruments to be repaired should be addressed to SERVICE AND REPAIR DEPARTMENT with transportation charges prepaid. Repaired instruments will be returned to the purchaser with transportation charges collect.

Berkeley reserves the right to make changes in design at any time without incurring any obligation to modify equipment previously purchased to conform to subsequent design changes.

BERKELEY DIVISION
BECKMAN INSTRUMENTS, INC.

CONTENTS

		Page
SEC. 1	INTRODUCTION	
1.1	General	1-1
1.2	Specifications	1-1
1.3	Applications	1-3
1.4	Accessories	1-4
SEC. 2	OPERATION	
2.1	General	2-1
2.2	Applying Power	2-1
2.3	Types of Measurements	2-2
2.4	Operating Controls and Connectors	2-2
2.5	Testing for Proper Operation	2-4
2.6	Modes of Operation	2-7
2.6.1	E/UT X Mode	2-9
2.6.2	COUNT X/SCAN Modes	2-10
2.6.3	TIM X-Y Mode	2-12
2.6.4	PERIOD Measurements	2-13
2.6.5	Ratio Measurements	2-16
2.6.6	Y ÷ X Mode	2-19
2.7	Inputs X and Y	2-19
2.8	Accuracy	2-25
2.9	Auxiliary Connectors	2-27
2.10	Remote Programming	2-29
SEC. 3	SERVICING	
3.1	Regulated Power Supply Adjustment	3-1
3.2	Oscillator Adjustment	3-3
3.3	Multiplier Adjustment	3-3
3.4	Attenuator Adjustment	3-5
SEC. 4	PARTS LIST	

MODIFICATIONS - 6100 Series

SCHEMATIC DIAGRAMS

Model 696	A415929-Rev. A
Unit Logic	D416995-Rev. B
Count Logic	D416994-Rev. B
50 Mc Amplifier	D416927-Rev. B
Control	D416918-Rev. C
Recycle	D411909-Rev. D
Time Base Logic	C411897-Rev. C
"S" Logic	C416921-Rev. C
"XY" Logic	C416924-Rev. A
"M" Logic	D416931-Rev. A
Legend	D418073-Rev. A
1 - 10 Mc Multiplier	B411803-Rev. A
1 Mc Precision Oscillator	C412391-Rev. C
1 Mc Precision Oscillator Oven Control	C412392-Rev. C
Power Supply	D411974-Rev. H

APPENDICES

Instruction Manuals:

- Model 850 Decimal Counting Unit
- Model 860 Decimal Counting Unit
- Model 862 Decimal Counting Unit
- Model 872 Decimal Counting Unit
- Data Storage Unit

SECTION 1

INTRODUCTION

1.1 GENERAL

The solid-state Beckman Model 6147 is a multipurpose 50 mc counter and timer designed to measure frequency, period, time interval, and frequency ratio. This versatility is complemented by an easy-to-read electroluminescent display panel, which provides an eight digit reading, and displays the correct unit of measurement and the appropriate decimal point.

Special features incorporated in the Model 6147 extend the flexibility of the instrument and increase its usability. For example, the MULTIPLE PERIOD setting of the MODE selector allows the operator to time and average as many as 10^6 periods, thus increasing the accuracy of period measurement.

LATCH and FOLLOW positions of the POWER switch provide another feature. In LATCH, there is a continuous EL display during a count interval, but in FOLLOW the EL display is continuously updated in its presentation during a count interval.

The first of an extensive line of accessories for the Model 6147 is discussed in paragraph 1.4. Other new accessories are being developed.

A TEST feature enables the operator to check the instrument for proper operation. See paragraph 2.5.

1.2 SPECIFICATIONS

Specifications for the Model 6147 are shown in Table 1-1.

Table 1-1. Specifications.

Measurements	
Frequency:	dc to 50 mc.
Period:	0.1 μs to 10^8 seconds (dc to 10 mc).
Multiple Period:	1 to 10^6 periods in decade steps (dc to 300 kc).
Time Interval:	0.1 μs to 10^8 seconds (dc to 10 mc).

continued . .

Table 1-1. Specifications - continued.

Resolution			
Gating:	Better than 0.1 μs.		
Counting:	Better than 0.02 μs.		
Input Characteristics			
Sensitivity (rms):	0.1v	1v	10v
Attenuation Factor:	1	10	100
Resistance (dc):	20k	200k	2 meg
Trigger Level:	±1v	±10v	±100v
DC Overload:	±50v	±300v	±600v
AC Overload (rms):	50v	300v	600v
DC Blocking:	600v	600v	600v
Coupling:	Selectable, ac or dc.		
Shunt:	Input resistance shunted by 40 pf. For ac coupling, 1.0 μf in series with input.		
Trigger Slopes:	Selectable, positive or negative.		
Stability			
Long Term:	2 parts in 10^8 per week average; 5 parts in 10^9 standard deviation.		
Short Term:	3 parts in 10^9 per 24 hrs. average; 1 part in 10^9 standard deviation.		
	Less than ±5 parts in 10^{10} for ±10% change in line voltage.		
	Less than 2 parts in 10^{10} per degree C.		
	Less than 1 part in 10^9 from open to short circuit, external loading.		

continued . . .

Table 1-1. Specifications - continued.

Accuracy	
Frequency:	±1 count ± oscillator stability.
Single Period:	0.3% for 1 volt rms sine-wave input with 40 db signal-to-noise ratio; ±1 count.
Multiple Period:	0.3% trigger error divided by periods averaged.
Time Base Selection	
Frequency:	1 μs to 10 seconds in decade steps.
Period:	0.1 μs to 1 second in decade steps.
Recycle Rate	Variable from 0.1 cps to 7 cps, or manually controlled.
Display	Eight electroluminescent digits with automatically selected decimal points and unit nomenclature (KC, MC, μSEC, mSEC, and SEC).
Coded Output	Four-line binary coded decimal. Binary 0: -10 volts with respect to ground. Binary 1: ground potential or slightly negative.
Environmental Specifications	
Operating Temp. Range:	-20 degrees C to +65 degrees C.
Storage Temp. Range:	-55 degrees C to +75 degrees C.

1.3 APPLICATIONS

Many laboratory, field test, and production line requirements are satisfied with the versatile Model 6147.

Laboratory uses might include frequency and stability checks on circuits under design, period measurements of low frequency waveforms where long term stability is essential, use as a secondary frequency standard, or calibrating less accurate frequency monitoring equipment.

The remote programming feature of this instrument makes it extremely useful for field test applications in integrated systems. An example would be in a military missile check-out system where a computer would remotely program the Model 6147 to measure period, frequency, ratio, etc., of the various electronic circuits in a missile guidance system.

Various transducers such as photocells, magnetic pickups and switches are useful in translating physical phenomena into voltage changes. With appropriate transducers, this instrument measures characteristics of such events relative to time. A few of the many applications are:

Telemetry
Tachometry
Pulse height analysis
Phase measurements
Relay and switch timing
Elasticity measurements
Frequency measurements
Frequency ratio measurements
Secondary frequency standard
Oscilloscope time base calibration
Viscosity and ballistic measurements

1.4 ACCESSORIES

Table 1-2 lists the solid-state plug-in units available for use with the Model 6147.

Table 1-2

Model 601 100 mc EPUT® Meter	Extends the direct count frequency measuring range of the Model 6147 to 100 mc.

continued . . .

Table 1-2 - continued.

Model 602 100 mc EPUT and Timer	Extends the direct count frequency measuring range of the Model 6147 to 100 mc, and time interval resolution to 0.01 microseconds.
Model 607 1000 mc Heterodyne	Indirectly extends the frequency measuring range of the Model 6147 to 1000 mc.
Model 651 Voltage to Frequency Converter	Indirectly allows the Model 6147 to measure dc voltages ranging from 0.1 to 1000 volts.

The plug-in units listed are the first of a complete line of plug-in units now in development.

The Model 1453 Printer, designed for use with this instrument, converts count information into a printed record. The printer records the count accumulated by the Model 6147 during each count interval. The printed count appears sequentially in Arabic numerals on a standard adding machine tape. This printer is ideal for making long term stability checks, recording voltage changes, or making a permanent printed record in control or measuring systems.

Beckman Data Reduction Converters reduce the digital readout information from the Model 6147 to a form suitable for actuating an IBM summary punch or an electric typewriter.

A Beckman Digital to Analog Converter converts the count accumulated during each counting period to a representative voltage level. This voltage level is retained by the Converter until a new count is made, at which time the Converter changes its voltage level to conform to the new count. The changing voltage levels can control the operation being monitored, or when applied across a self-balancing potentiometer, drive a pen recorder for an analog record.

Other units such as the Model 7580 Transfer Oscillator extend the range of frequency measurement to 21Gc.

SECTION 2

OPERATION

2.1 GENERAL

The Model 6147 has two input circuits, a time base generator, a signal gate, a chain of decimal counting units (DCU's), and data storage units (DSU's) with an EL display. The input circuits (INPUT's X and Y) produce output pulses representative of the voltage change at their inputs. These pulses can be used as start, stop, or count signals. The time base generator produces clock pulses (selected by TIME selector) which also are used as start, stop, or count signals. Depending on the mode (E/UT X, TIM X-Y, etc.) selected by the MODE selector, the three pulse sources supply start signals to open the gate, stop signals to close the gate, and count signals which pass through the gate to be counted by the DCU's. The count accumulated by the DCU's is transferred to the DSU's, and displayed on the EL panel.

In E/UT X, for example, the INPUT X circuits provide count signals, while the clock pulse generator provides start and stop signals. See paragraph 2.6 for specific information on the individual modes of operation.

2.2 APPLYING POWER

The instrument is ready for use as it arrives from the factory. Connect the power cord to a 117v ac, 50-60 cps, outlet. The crystal oven and oscillator circuits energize immediately, and the instrument is ready for operation. The crystal oven and oscillator circuits will reach a stability of 5 parts in 10^8 after about two weeks of operation. Therefore, if the instrument is used intermittently, leave the power cord connected at all times to avoid waiting for crystal warm-up.

NOTE

Do not remove the Model 696 Plug-in Unit unless other plug-ins are used. Each plug-in completes certain circuits in the instrument that are essential for operation.

2.3 TYPES OF MEASUREMENTS

The Model 6147 makes the three basic measurements in addition to manually gated counting.

1) It counts the number of events occurring during a precise time interval. This is E/UT operation. Frequency measurements are made in this mode.

2) It measures the time interval between two events. For Time Interval Measurement (TIM) the two events occur on separate input channels. For PERIOD measurements the two events occur on the same input channel. If the interval at the same input is multiplied by some factor (10, 10^2, etc.), thus extending the counting period, the operation is known as MULTIPLE PERIOD.

3) It counts the number of events at one input during the interval between consecutive events at the other input. This mode of operation is known as Ratio (more specifically, frequency ratios). Ratio measurements are made in two ways: (a) UNITS Y/PERIOD X, (b) UNITS Y/MULTIPLE PERIOD X.

2.4 OPERATING CONTROLS AND CONNECTORS

Operating controls and connectors are described in Table 2-1.

Table 2-1

Name	Function
POWER Switch	Turns power on when turned to LATCH or FOLLOW.
FOLLOW Position	Part of POWER Switch. Causes EL reading to continually update its presentation during count interval, and then hold reading into next count interval.
LATCH Position	Part of POWER Switch. Readout displays the total count of each counting interval and holds it without change until there is a new total count.

continued. . .

Table 2-1 - continued.

Name	Function
TIME Selector	Selects Gate Time for E/UT X and TEST measurements. Also selects TIME Units in which measurement appears for 1 PERIOD X, MULTIPLE PERIOD X, and TIM X-Y. Selects INPUT Y Circuit for ratio measurement.
MODE Selector	Interconnects logic blocks to perform the measurement indicated.
ATTEN FACTOR Control	Attenuates the signal and dc level at the input jack by the factor to which the control is set. Selects ac or dc input coupling to the attenuator.
TRIGGER Control	Selects the instantaneous voltage at which the input signal causes the input trigger circuit to generate an output pulse.
SLOPE Switches	Determine which slope (positive or negative) of the input signal will start or stop the counting action.
RECYCLE RATE Control	Controls the rate at which the instrument will sample new data. In MAX position, counter recycles at a maximum rate. MAN: Instrument recycle is manually controlled by pressing RESET pushbutton.

continued. .

Table 2-1 - continued.

Name	Function
Manual RESET Pushbutton	With latched indication the RESET control performs either of two functions dependent upon whether the Count Gate is closed or open. Closed: Accumulated data is transferred to the DSU's and presented on the EL display and a new count accumulated. Open: Instrument is reset to zero and a new count accumulated. Stored data is retained. With FOLLOW indication the RESET control causes instrument to reset to zero and accumulate a new count.
INPUT Jacks	For signal inputs to INPUTS X and Y.
GATE OPEN Light	Light is on when count gate is open. Provides additional visual indication of counter recycle.

NOTE

See Auxiliary Connectors, paragraph 2.9, for information on connectors used in special variations of the standard operating procedure.

2.5 TESTING FOR PROPER OPERATION

The self-checking procedure is simple, quick, and may be performed each time the instrument is energized.

1) Set POWER switch to LATCH.

2) Turn RECYCLE RATE control fully clockwise to obtain a maximum recycle rate.

3) Turn MODE selector to TEST.

4) Turn TIME selector to each time position starting with 1 μsecond and continuing to 10 seconds. The following count indications should appear:

TIME Selector Position	Correct Count Indications				
1 μsec.	00000009	or	00000010	or	00000011
10 μsec.	00000099	or	00000100	or	00000101
0.1 msec.	00000999	or	00001000	or	00001001
1 msec.	00009999	or	00010000	or	00010001
10 msec.	00099999	or	00100000	or	00100001
0.1 sec.	00999999	or	01000000	or	01000001
1 sec.	09999999	or	10000000	or	10000001
10 sec.	99999999	or	00000000	or	00000001

5) If a correct count indication appears at all positions, the instrument is operating properly.

6) Instrument may be tested in FOLLOW to observe count change. Retard RECYCLE RATE control to approximately 1 reading per second for best observation.

2.5.1 EL Indicator Panel Check

To visually test the EL indicator panel, place the MODE selector in 10^6 MULTIPLE PERIOD X and the TIME selector in any position from 0.1 mseconds to 10 seconds. All eights will appear on the panel showing the 7-bar configuration of each of the 8 digits.

Any incompatible setting of the TIME and MODE selectors will cause all eights to appear on the EL panel. Table 2-2 shows the incompatible positions of the two controls.

As shown in Table 2-2, the TIM X-Y and 1 PERIOD X modes are made incompatible with a 10 second time base. The long time duration needed between start and stop pulses, to allow enough counts (1 count/10 seconds) to be accumulated by the DCU's, make these modes of operation impractical. For example, in order to count ten clock pulses from the time base, the start and stop pulses would have to be separated by 100 seconds.

Table 2-2

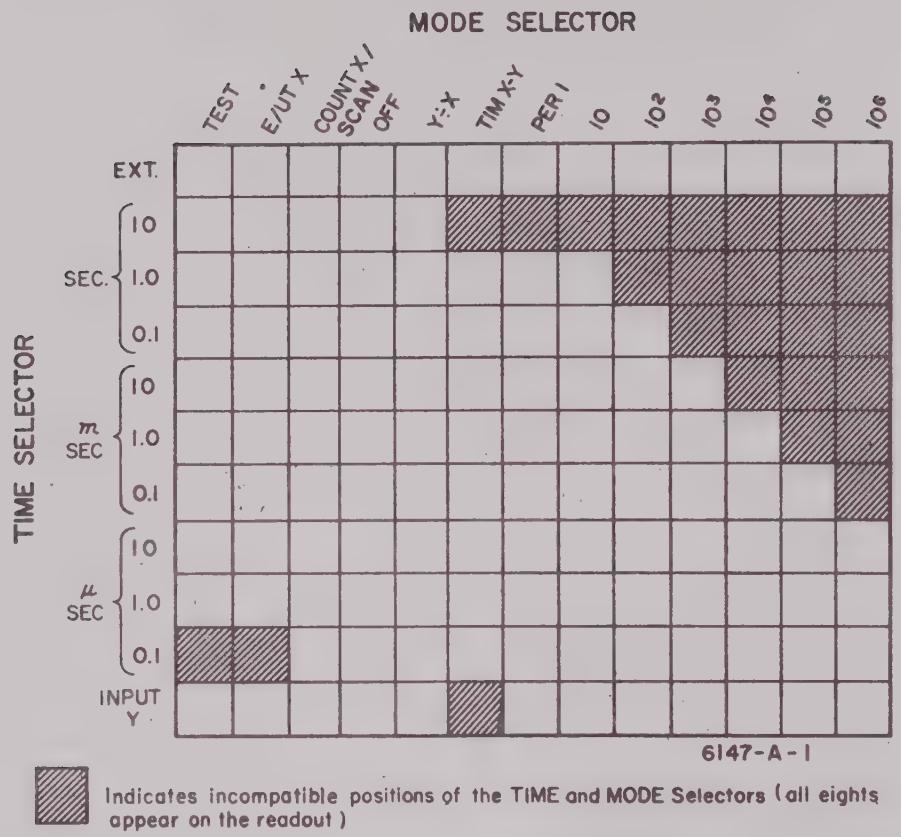


Table 2-2 also shows that MULTIPLE PERIOD positions (10, 10^2, etc.) of the MODE selector are incompatible with certain positions of the TIME selector. To understand why some TIME and MODE selector positions are incompatible, it is first necessary to understand the operation of the DCU divider chain.

The DCU divider chain serves as time base dividers, or as dividers for MULTIPLE PERIOD operation. Each DCU in the divider chain performs one function; i. e., to divide its input by 10. The DCU cannot simultaneously divide clock pulses, and also divide a series of pulses from the INPUT X circuit in some MULTIPLE PERIOD position. Therefore, the DCU can only be used for one function at a time.

Thus, incompatible positions occur when the same DCU is selected for simultaneous use as a time base divider and as a divider for MULTIPLE PERIOD operation.

For example, setting the TIME selector to 1 mSEC and the MODE selector to 10^5 PERIOD X causes the same DCU to perform two functions. This results in an incompatible position. Figure 2-1 shows the logic of the DCU divider chain.

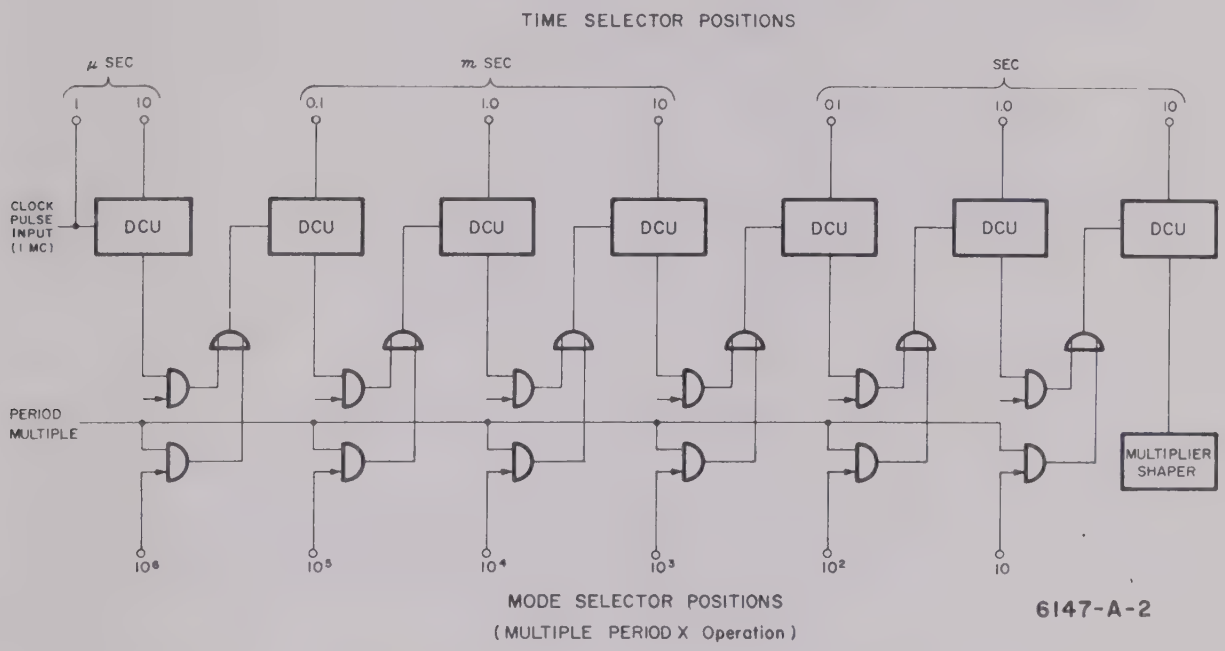


FIG. 2-1. Simplified block diagram of DCU Divider Chain.

With the TIME selector in 0.1 μSEC and the MODE selector in either TEST or E/UT, all eights will appear in the EL display. While the signal gate would respond to a 0.1 μsecond gate interval, the count obtained would be limited to a single digit. Such data is insignificant; therefore, this Gate time is not used.

With the TIME selector in UNITS Y and the MODE selector in TIM X-Y, eights appear in the readout. Input Y provides the pulse to close the count gate; therefore, any pulse that could be counted would also close the gate.

2.6 MODES OF OPERATION

Refer to Table 2-3.

Table 2-3

Modes of operation	What the instrument does in each mode
TEST	Counts 10 mc multiplier output during each timing interval.
E/UT X	Counts events at INPUT X during a time unit selectable between 1 μsecond and 10 seconds by TIME selector (frequency measurement).
COUNT X/SCAN	COUNT X: Counts events at INPUT X during manually controlled period. SCAN: Counts events at INPUT X during manually controlled multiples of the time base.
OFF	For manual control of COUNT X.
Y ÷ X	Measures ratio of INPUT Y frequency to INPUT X frequency (number of events at INPUT Y during one event at INPUT X). This mode is primarily designed for use with Beckman Model 7580 Transfer Oscillator.
TIM X-Y	Time Interval Measurement. Measures the interval between an event at INPUT X and an independent event at INPUT Y. Time units (0.1 μsec. to 1 sec.) selected by TIME selector.
PERIOD X	1 PERIOD X: Measures the time interval between consecutive events at INPUT X. Time units (0.1 μsec. to 1 sec.) selected by TIME selector. MULTIPLE PERIOD X: Measures the time interval between multiple events ($10, 10^2, \ldots 10^6$) at INPUT X.

continued. . .

Table 2-3 - continued.

Modes of operation	What the instrument does in each mode
Ratio	UNITS Y/1 PERIOD X: TIME selector set to UNITS Y, and MODE selector to 1 PERIOD X. Measures ratio of INPUT Y frequency to INPUT X frequency (number of events at INPUT Y during one event at INPUT X). UNITS Y/MULTIPLE PERIOD X: TIME selector set to UNITS Y, and MODE selector to one of the MULTIPLE PERIOD positions (10, 10^2, ... 10^6). Measures ratio of INPUT Y frequency to multiples of INPUT X frequency.

2.6.1 E/UT X Mode

With the MODE selector in E/UT X, the instrument counts events at INPUT X during unit of time selectable between 1 μsecond and 10 seconds (frequency measurements). The functional blocks connect as shown in Figure 2-2.

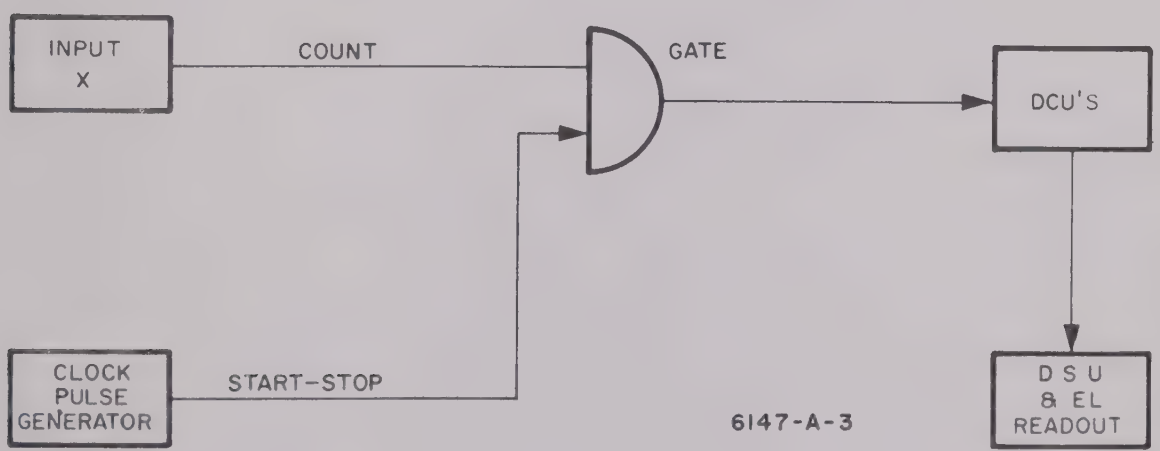


FIG. 2-2. E/UT X Mode

Operating Procedure

1) Connect the input signal to the INPUT X. Adjust the ATTEN control as described in paragraph 2.7.7.

2) Turn the MODE selector to E/UT X.

3) Set the TIME selector to the time interval over which events are to be counted. A longer time base will increase the number of digits displayed, thus increasing measurement accuracy.

4) Adjust RECYCLE RATE control for a convenient reading or recording rate.

5) The readout displays count, units, and decimal point.

2.6.2 COUNT X/SCAN Modes

2.6.2.1 COUNT X Mode

With the MODE selector at COUNT X, the instrument counts events at INPUT X during manually controlled counting period. The functional blocks connect as shown in Figure 2-3.

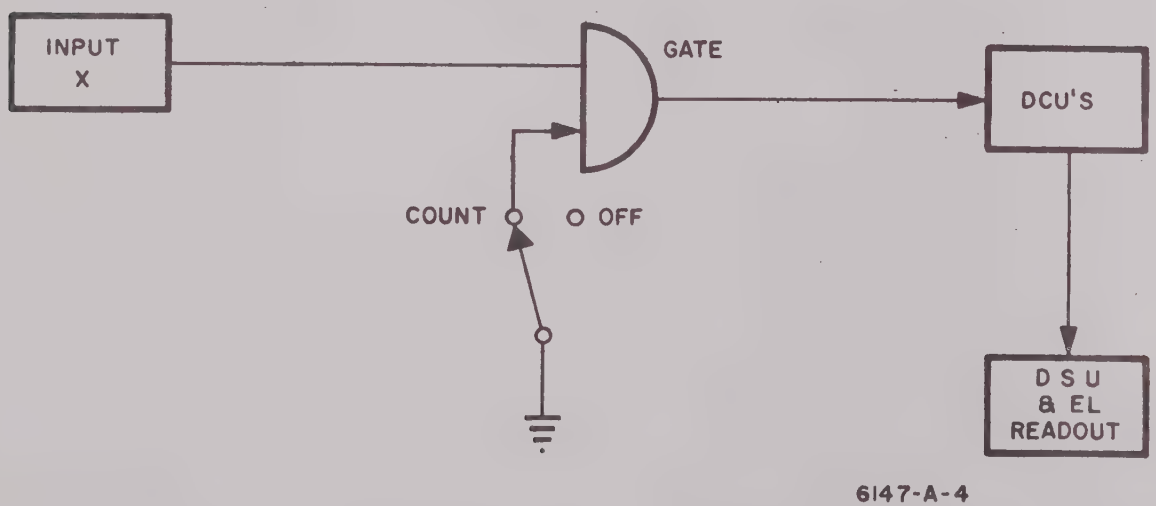


FIG. 2-3. COUNT X Mode

Operating Procedure

1) Connect input signal to INPUT X. Adjust ATTEN control as described in paragraph 2.7.7.

2) Turn MODE selector to OFF.

3) Press manual RESET button. This resets counter to zero.

4) Turn MODE selector to COUNT. This begins the counting action. The input channel will trigger only on the negative slope of the input waveform.

5) Turn MODE selector to OFF to stop the counting. The GATE OPEN light will stay on continuously in this mode of operation.

6) Read the count indication. To continue counting without erasing the previous indication, turn MODE selector back to COUNT.

2.6.2.2 SCAN Mode

The SCAN function counts events at INPUT X during manually controlled multiples of the time base setting and provides a method of measuring low frequencies accurately without resorting to period measurement. The functional blocks connect as shown in Figure 2-4.

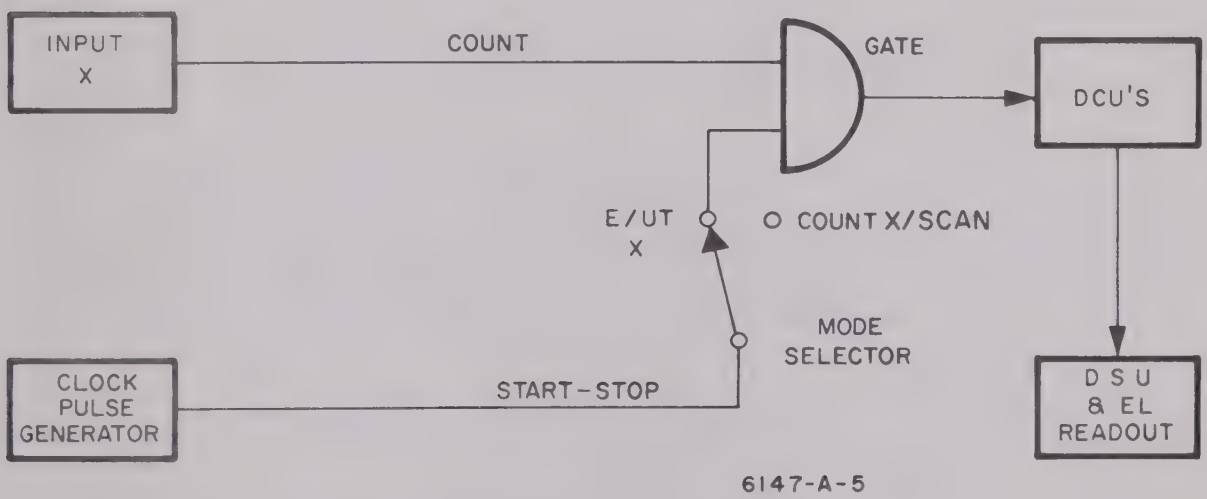


FIG. 2-4. SCAN Mode

Operating Procedure

1) Connect input signal to INPUT X. Adjust ATTEN control as described in paragraph 2.7.7.

2) Switch RECYCLE RATE control to MAN.

3) Turn MODE selector to E/UT X.

4) Turn TIME selector to 10 SEC.

5) Turn POWER switch to either LATCH or FOLLOW.

6) Press the RESET pushbutton to start the counting action, and begin timing the desired number of period measurements. With TIME selector in 10 SEC, each timing period is 10 seconds.

7) Quickly turn MODE selector to COUNT X. Continue timing the periods.

8) Approximately halfway through the last timing period, turn the MODE selector back to E/UT X. Counting will stop with the next stop pulse.

9) Count remains on EL display until instrument is manually recycled.

10) To obtain the input frequency in events per second, divide the count indication by the total counting interval in seconds. Example: If the count displayed is 10,000 and the number of timing periods is 100 (10 seconds times 10 periods = 100), the input frequency is 100 events per second.

11) To start a new measurement, repeat steps 6, 7, 8, and 9.

2.6.3 TIM X-Y Mode

With the MODE selector in TIM X-Y, the instrument measures the interval between an event at INPUT X and an independent event at INPUT Y. The functional blocks connect as shown in Figure 2-5.

Operating Procedure

1) Connect the stop signal to INPUT Y. Adjust INPUT Y TRIGGER control as described in paragraph 2.7.8.

2) Connect the start signal to INPUT X. Adjust INPUT X TRIGGER control as described in paragraph 2.7.7.

3) Turn MODE selector to TIM X-Y.

4) The START and STOP SLOPE switches select the polarity of the voltage excursion that starts and stops the counting period, respectively.

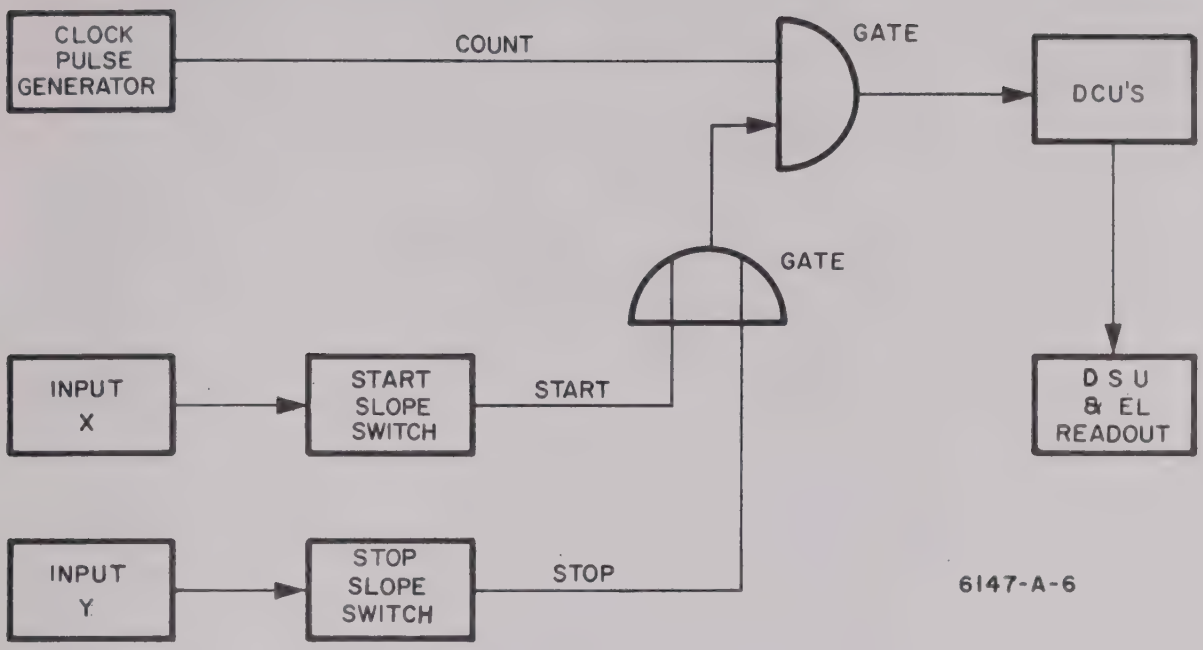


FIG. 2-5. TIM X-Y Mode

5) Set the TIME selector to the desired unit of time measurement. For example, at the 1 mSEC position the time measurement appears with one millisecond resolution. The smaller the time unit chosen, the greater the resolution.

6) Adjust the RECYCLE RATE control for a convenient reading or recording rate.

7) The readout automatically displays count, units, and decimal point.

2.6.4 PERIOD Measurements

2.6.4.1 PERIOD X Mode

With the MODE selector in 1 PERIOD X, the instrument measures the interval between consecutive events at INPUT X. This mode measures the period of a cyclical waveform, the width of a pulse, or separation of pulses. The functional blocks connect as shown in Figure 2-6.

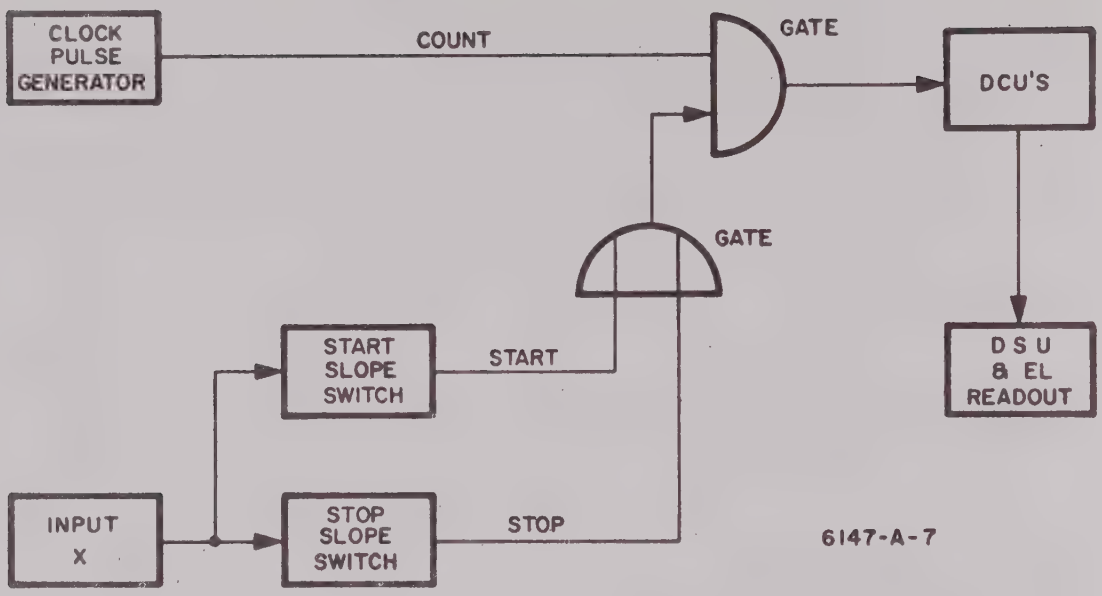


FIG. 2-6. PERIOD X Mode

Operating Procedure

1) Connect input signal to INPUT X. Adjust the ATTEN control as described in paragraph 2.7.6. An oscilloscope may be required to position trigger points on asymmetrical waveforms. A SCOPE jack on the rear panel provides an output representing the Count Gate. Triggering the oscilloscope at the opening or closing of the Count Gate while monitoring the input waveform, permits the operator to see the start or stop points on the input waveform.

2) Turn MODE selector to 1 PERIOD X.

3) The START SLOPE switch selects the polarity of the voltage excursion that starts the timing period: the STOP SLOPE switch selects the polarity of the excursion that stops timing. Therefore,

   a) To measure the period of a cyclical waveform, set both SLOPE switches to "+" or both to "-".

   b) To measure the width of a positive waveform, set the START SLOPE switch to "+" and the STOP SLOPE switch to "-".

c) To measure the width of a negative waveform, set the START SLOPE switch to "-" and the STOP SLOPE switch to "+".

d) To measure positive pulse separation, set the START SLOPE switch to "-" and the STOP SLOPE switch to "+", or vice versa for negative pulses.

4) Switch the TIME selector to the desired unit of time measurement. For example, at the 1 mSEC position the time measurement appears with one millisecond resolution. The smaller the time unit chosen, the more accurate the reading within limits of period accuracy.

5) Adjust the RECYCLE RATE control for a convenient reading or recording rate.

6) Readout automatically displays count, units, and decimal point.

2.6.4.2 MULTIPLE PERIOD X Mode

With the MODE selector at one of the MULTIPLE PERIOD positions (10, 10^2, ... 10^6), the instrument measures the interval between multiple events at INPUT X. These settings will measure the period of an event more accurately than 1 PERIOD X by averaging a greater number of periods over which counting occurs. The functional blocks connect as shown in Figure 2-7.

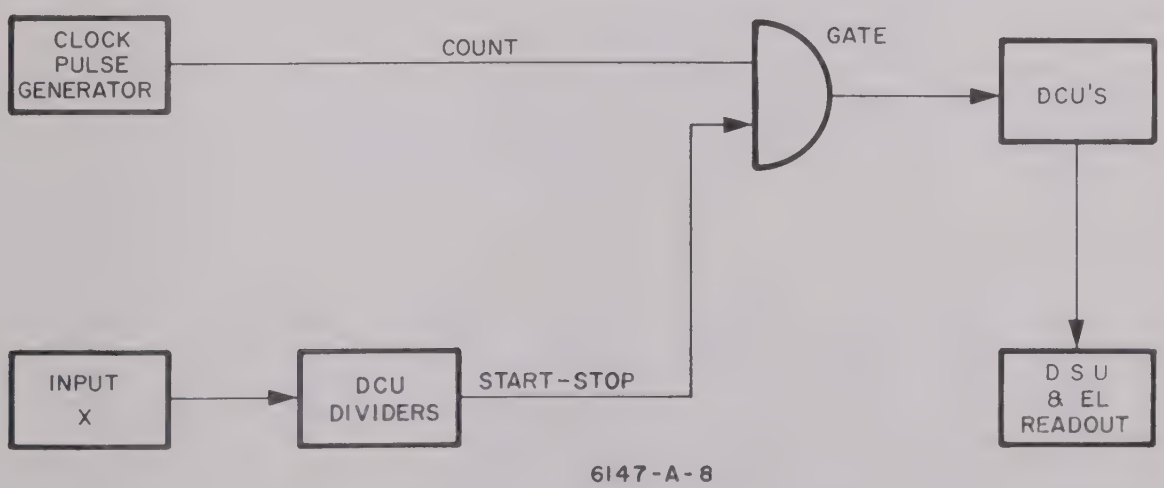


FIG. 2-7. MULTIPLE PERIOD X Mode

Operating Procedure

1) The INPUT X TRIGGER adjustment is made the same as in 1 PERIOD X. The maximum frequency that can be used in MULTIPLE PERIOD X is 300 kc as limited by the DCU dividers.

2) Select a position (10, 10^2, ... 10^6) on the MODE selector. The larger the number, the greater the number of periods over which counting will be averaged.

3) Set the TIME selector to desired unit of time measurement. The smaller the time unit chosen, the greater the resolution.

NOTE

> There are certain positions of the TIME and MODE selectors that are incompatible. See Table 2-2.

4) INPUT X triggers only on the negative slope of the input waveform.

5) Adjust the RECYCLE RATE control for a convenient reading or recording rate.

6) Readout automatically displays count, units and decimal point.

2.6.5 Ratio Measurements

2.6.5.1 UNITS Y/PERIOD X Mode

With the MODE selector in 1 PERIOD X and TIME selector in UNITS Y, the instrument measures ratio of INPUT Y frequency to INPUT X frequency (number of events at INPUT Y during one event at INPUT X). Functional blocks connect as shown in Figure 2-8.

Operating Procedure

1) Connect the higher frequency to the INPUT Y. Adjust INPUT Y ATTEN control as described in paragraph 2.7.8.

2) Connect the lower frequency to the INPUT X. Adjust INPUT X ATTEN control as described in paragraph 2.7.7.

3) Switch MODE selector to 1 PERIOD X, and the TIME selector to UNITS Y.

4) The START SLOPE switch determines the polarity of the voltage excursion that starts the counting period. The STOP SLOPE switch sets the polarity of the voltage excursion that stops the counting period. Therefore,

   a) When measuring the ratio of two frequencies set both SLOPE switches to "+" or both to "-".

   b) When counting the INPUT Y during the period that INPUT X voltage remains below a certain negative level, set the START SLOPE switch to "-" and the STOP SLOPE switch to "+".

5) The INPUT Y triggers on a negative-going input.

6) Adjust the RECYCLE RATE control for a convenient reading or recording rate.

7) The readout automatically displays count information.

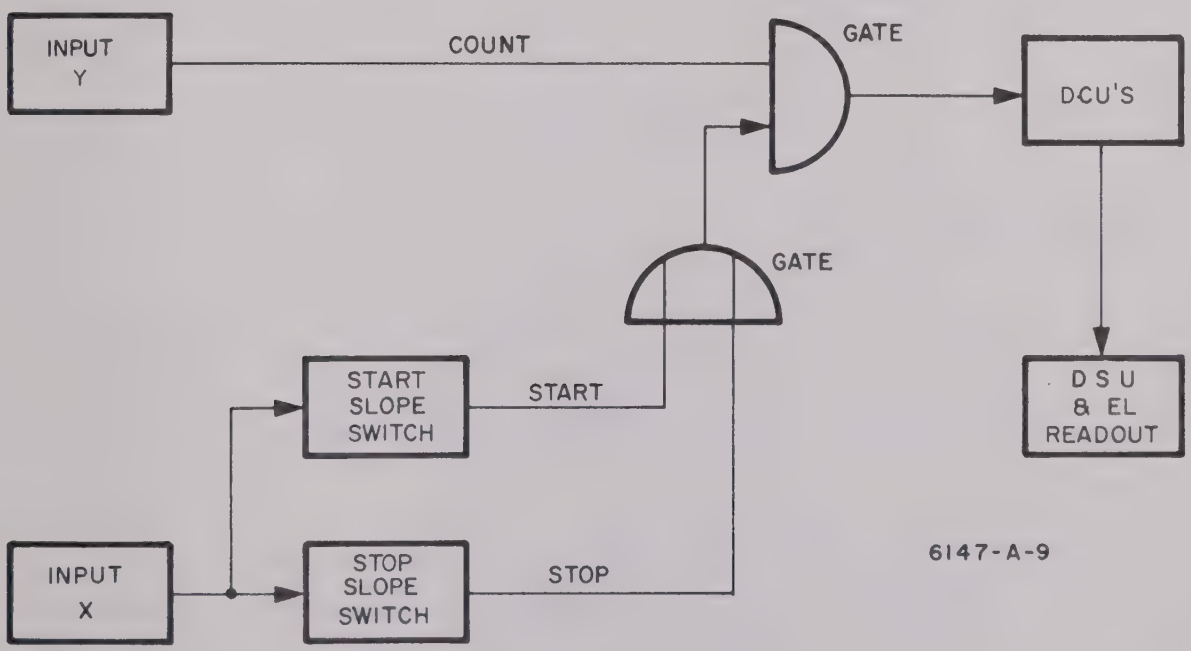


FIG. 2-8. UNITS Y/PERIOD X Mode

2.6.5.2 UNITS Y/MULTIPLE PERIOD X Mode

With the MODE selector in one of the MULTIPLE PERIOD X positions and the TIME selector in UNITS Y, the instrument measures ratio of INPUT Y to multiple events at INPUT X. Ratio measurements are more accurate using multiple periods because a greater number of periods are averaged over which INPUT Y is counted. Functional blocks connect as shown in Figure 2-9.

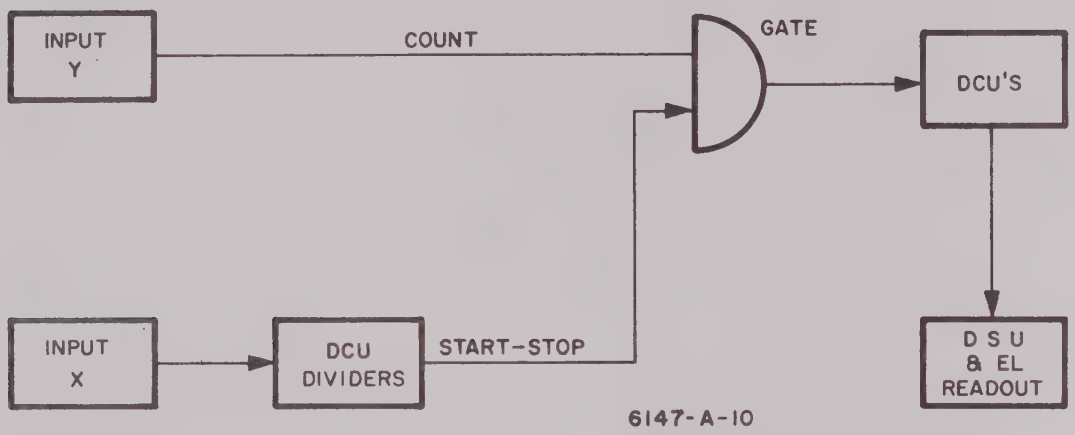


FIG. 2-9. UNITS Y/MULTIPLE PERIOD X Mode

Operating Procedure

1) Set up the input channels as in UNITS Y/1 PERIOD X.

2) Turn MODE selector to some position of MULTIPLE PERIOD X (10, 10^2, ... 10^6, etc.). The number of periods selected determines the number of events required at INPUT X to start and stop counting. Counting starts and stops on the negative-going slope of the INPUT X signal for periods of 10 through 10^6.

3) Switch TIME selector to UNITS Y. The INPUT Y channel triggers on the negative-going input signal.

4) Adjust RECYCLE RATE for a convenient reading or recording rate.

5) The readout displays count information and automatically places the decimal.

2.6.6 Y ÷ X Mode

This mode is primarily designed for use with the Beckman Model 7580 Transfer Oscillator. With MODE selector in Y ÷ X, the instrument measures ratio of INPUT Y frequency to INPUT X frequency (number of events at INPUT Y during one event at INPUT X). When used with the Transfer Oscillator, the TIME selector is used to select a desired frequency from the time base with output available at the rear panel.

2.7 INPUTS X AND Y

Information in this section applies to both INPUTS X and Y, since these input circuits are identical. Figure 2-10 is a block diagram of one of these input circuits.

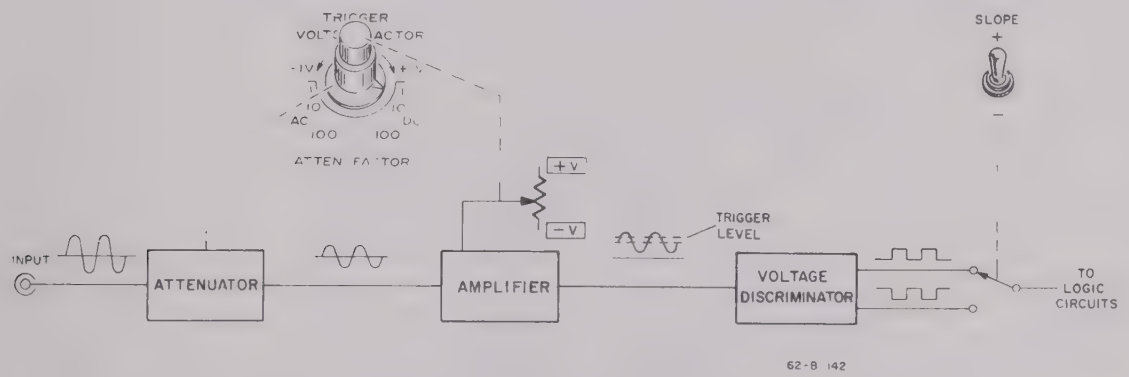


FIG. 2-10. Simplified Input Circuit Block Diagram

2.7.1 ATTEN FACTOR Control

2.7.2 Input Coupling

The ATTEN FACTOR selector selects AC or DC coupling and input attenuation. In the DC position the dc (plus the ac component of the input signal) couples to the attenuator. Switching to AC places a 1.0μf, 600v capacitor between the input jack and the attenuator permitting only the ac component of the input to reach the attenuator. The equivalent input circuit is 20K ohms, 200K ohms, and 2M ohms for 1, 10, and 100 ATTEN FACTOR positions, respectively. The input circuit is shunted with approximately 40 pf at each attenuator position.

2.7.3 Attenuation

Each position of the ATTEN FACTOR control divides the input signal by the factor indicated (1, 10, and 100). Effectiveness of the TRIGGER control depends on the correct use of the ATTEN FACTOR control. Since these two controls are interdependent, the use of the ATTEN FACTOR control is discussed with the TRIGGER control in paragraph 2.7.4.

2.7.4 The TRIGGER Control

As shown in Figure 2-10, the TRIGGER control is part of the amplifier, and determines the voltage at which an input signal causes the input circuits to generate an output pulse. The amplifier output signal drives a voltage discriminator circuit. The discriminator exhibits a characteristic known as hysteresis which is a small, fixed, voltage range centered around a fixed dc level at the discriminator input. When a voltage change passes through the hysteresis range, the output changes voltage levels (Figure 2-11A). This voltage level remains until a voltage change again passes back through the hysteresis range, at which time the discriminator output returns to its original state (Figure 2-11B).

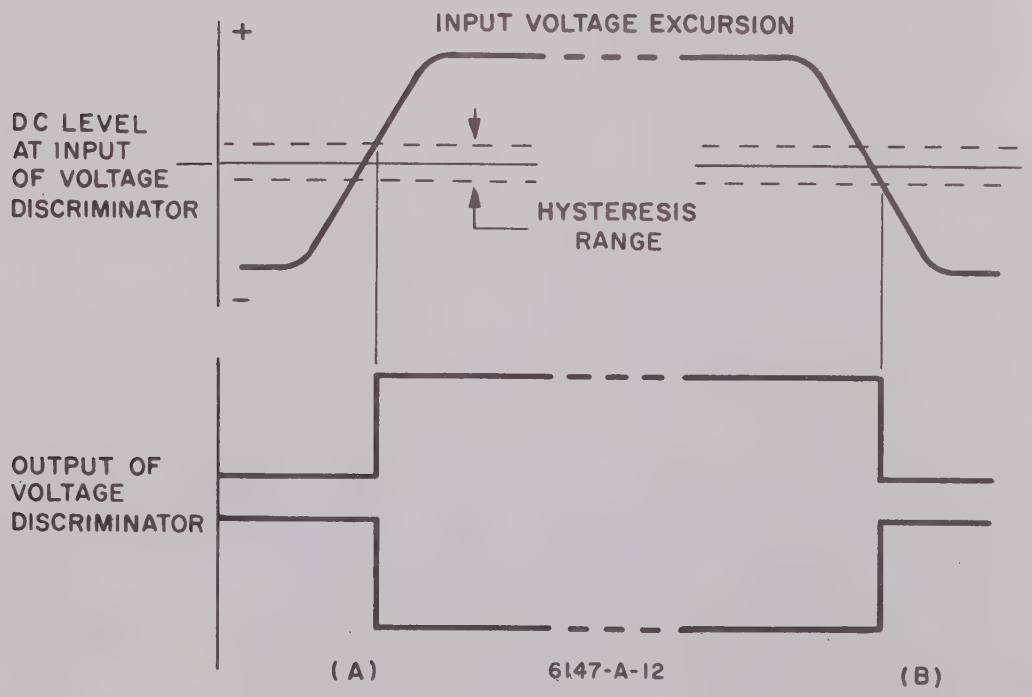


FIG. 2-11. Shows output of voltage discriminator as a voltage change passes through hysteresis range.

The amplifier output is shifted by the TRIGGER control in either a positive or negative direction to allow the operator to choose a particular point on the waveform to trigger the discriminator circuit. As long as the amplitude of the voltage change is large enough to pass through the hysteresis range, triggering will occur.

For example, with the ATTEN FACTOR control in AC "1", the TRIGGER control adjustment range is ±1 volt; that is, it can shift a signal referenced at the input over a ±1 volt range at the discriminator input. Using a 10 volt peak-to-peak input, the ±1 volt adjustment range is not adequate to shift the 10 volt peak-to-peak signal enough in a positive or negative direction to permit any desired part of the signal to pass through the hysteresis range of the discriminator circuit (see Figure 2-12A). Therefore, the ATTEN FACTOR control becomes important. By setting the ATTEN FACTOR control to AC "10", the input signal driving the amplifier is attenuated by a factor of 10, thus the signal driving the amplifier is 1 volt peak-to-peak. A 1 volt peak-to-peak signal can be shifted enough so the desired part passes through the hysteresis range of the discriminator circuit (see Figure 2-12B).

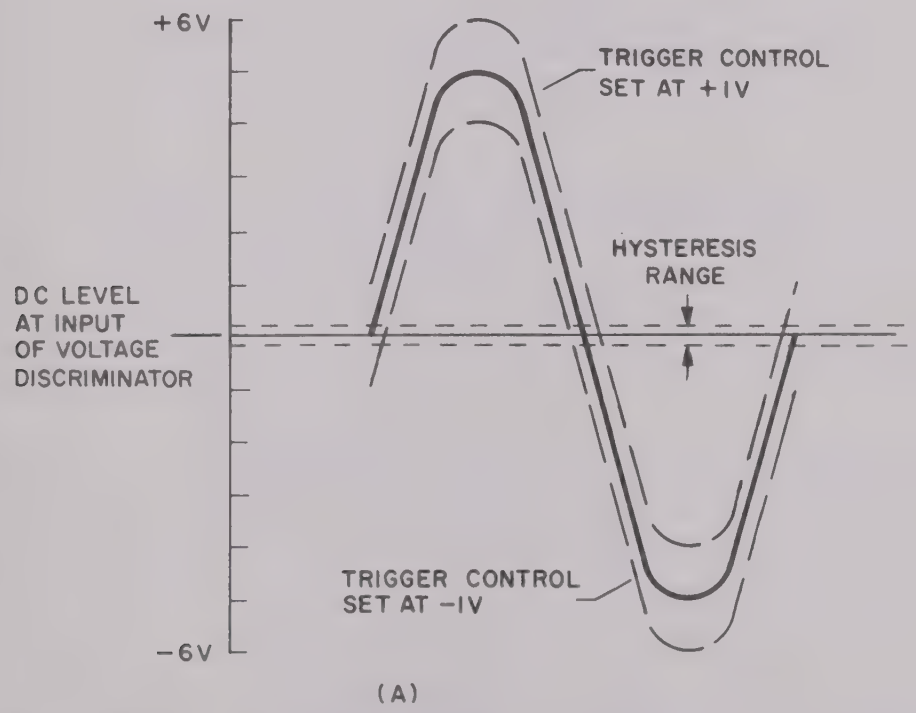


FIG. 2-12 (A). Shows TRIGGER control range is not enough to shift any part of input signal through hysteresis range of voltage discriminator.

The input signal is reduced to fall within the range of the TRIGGER control. Therefore, effective range of this control is multiplied by the setting of the ATTEN FACTOR (i.e., 10, 100).

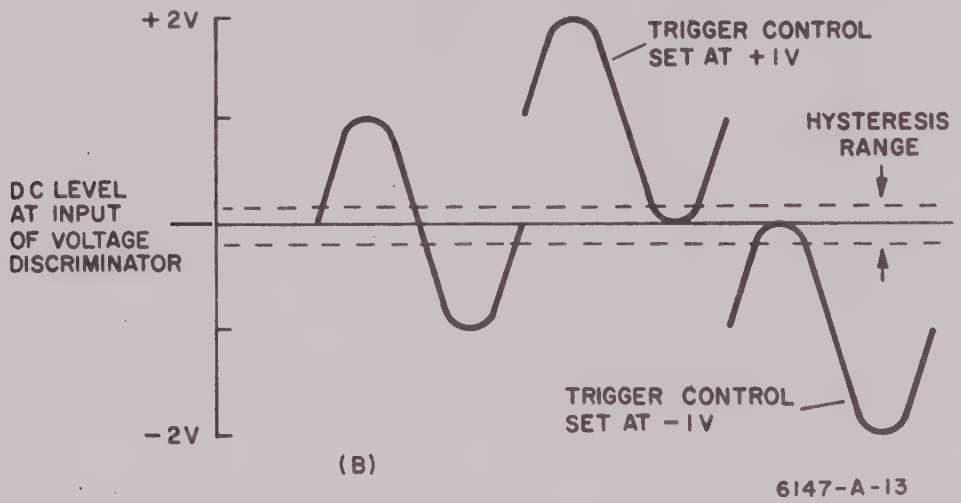


FIG. 2-12 (B). Shows TRIGGER control is enough to shift any part of input signal through hysteresis range of voltage discriminator.

For dc coupled signals, the dc level (plus the ac component) has to be considered in adjusting the ATTEN FACTOR and TRIGGER controls. If the dc level is large, the ac component may never be within range of the TRIGGER control; therefore, the ATTEN FACTOR control may have to be set to 10 or 100. However, since the ac component is also attenuated, it may then be less than minimum sensitivity of the discriminator circuit.

2.7.5 SLOPE Switches

The SLOPE switch determines which slope (positive or negative) of the input signal will start or stop the counting.

Figure 2-13 shows the input signal slopes in relation to the discriminator output pulse.

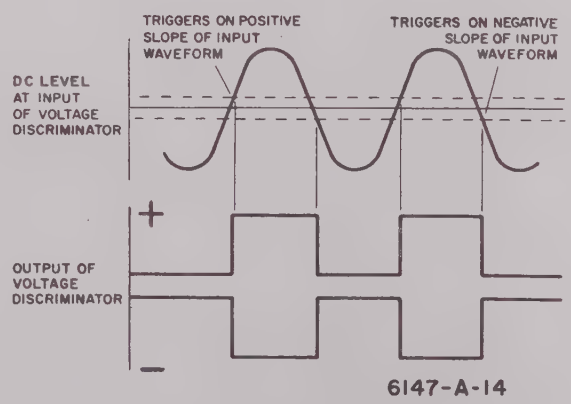

TRIGGERS ON POSITIVE SLOPE OF INPUT WAVEFORM
TRIGGERS ON NEGATIVE SLOPE OF INPUT WAVEFORM
DC LEVEL AT INPUT OF VOLTAGE DISCRIMINATOR
+
OUTPUT OF VOLTAGE DISCRIMINATOR
-
6147-A-14

FIG. 2-13. Voltage discriminator output with sine wave input.

Logic circuits in this instrument respond only to positive-going slopes of the voltage discriminator output; therefore, it is possible to select the desired slope of the input signal to operate the instrument.

For example, the period of a sine wave can be determined by setting both SLOPE switches to "+" or "-". The positive slopes of the input waveform correspond to the "+" setting of the SLOPE switch and to the positive-going slope of the positive output pulse of the discriminator. The negative slopes of the input waveform correspond to the "-" setting of the SLOPE switch and to the positive-going slope of the negative output pulse of the discriminator.

2.7.6 Using the TRIGGER Control

The purpose of the input trigger channel is to produce a reliable pulse output representing a selected part of the input signal. Proper adjustment of the ATTEN FACTOR and TRIGGER controls ensures this condition. Before adjusting the controls, try to visualize the input waveform, noting the ac acmplitude and dc level. The effect of various control settings is as follows:

1) If the attenuated signal is small (p-p), the trigger voltage level may be set too high or too low to produce a pulse.

2) If the attenuated voltage variations "ride" on a dc level, they may not come within the trigger voltage range.

3) Modulation or other variation of the attenuated signal is least likely to cause trigger failure if the trigger voltages are set about halfway between the peaks of the signal.

4) Extraneous signals (noise or modulation) have the least effect on the time at which a pulse occurs when the input circuit triggers on a steep slope of the waveform.

5) Noise below the range of the trigger circuit will not trigger extraneous pulses. Consequently, attenuating a noisy signal may reduce the effect of the noise.

6) Attenuating the input signal:

   a) Reduces the slope at all points.

   b) Shifts the ac component nearer ground if it rides on a dc level.

   c) Increases the minimum peak-to-peak variations necessary to trigger the input circuit (measured at the INPUT).

   d) Increases the range of possible trigger voltage control over the input signal from ±1 volt to ±100 volts.

2.7.7 INPUT X TRIGGER Control Adjustment

1) Set ATTEN FACTOR control to 100.

2) Couple signal to INPUT X.

3) Switch MODE selector to COUNT X.

4) Slowly turn TRIGGER control between its extreme positions, and note whether counting occurs. If counting occurs, proceed to step 6; otherwise, continue on to step 5.

5) Repeat step 4, each time reducing the attenuation factor, i.e., 10, 1, until counting occurs. If no counting occurs in ATTEN "1", determine if an adequate input signal is present.

6) By turning the TRIGGER control, determine the positions which start and stop counting, then set the control midway between these two positions. The INPUT X trigger circuit should now be operating properly.

7) Refer to paragraph 2.6 for further information on mode being used.

2.7.8 INPUT Y TRIGGER Control Adjustment

1) Make sure no signal is connected to INPUT X.

2) Switch MODE selector to PERIOD X.

3) Switch TIME selector to UNITS Y.

4) Set ATTEN FACTOR control to 100.

5) Connect signal to INPUT Y.

6) Rotate INPUT X TRIGGER control through its range until GATE OPEN light comes on.

7) Slowly turn TRIGGER control between its extreme positions, and note whether any counting occurs. If counting occurs, proceed to step 9; otherwise, continue on to step 8.

8) Repeat step 7, each time reducing the attenuation factor, i.e., 10, 1, until counting occurs. If no counting occurs in ATTEN "1", determine if an adequate input signal is present.

9) By turning the TRIGGER control, determine the positions which start and stop the counting, then set the control midway between these two positions.

10) Refer to paragraph 2. 6 for further information on mode being used.

2.8 ACCURACY

Accuracy of a measurement depends on the sum of errors contributed from four sources: the gating action, the internal time standard, the input signal (that does not truly represent the event being measured), and the resolution of the instrument.

2.8.1 Error Due to Gating Action

Figure 2-14 shows how gating action may cause the indication to be in error as much as ±1 count. If the gate opens just before one clock pulse and closes immediately after another, the indication may be one time unit high. But if the gate opens just after a pulse and closes just before another, the indication may be one time unit low. In no case will the error be greater than one time unit. In TIM and PERIOD measurement, this error will be very slight if the time units chosen are small in comparison to the interval being timed.

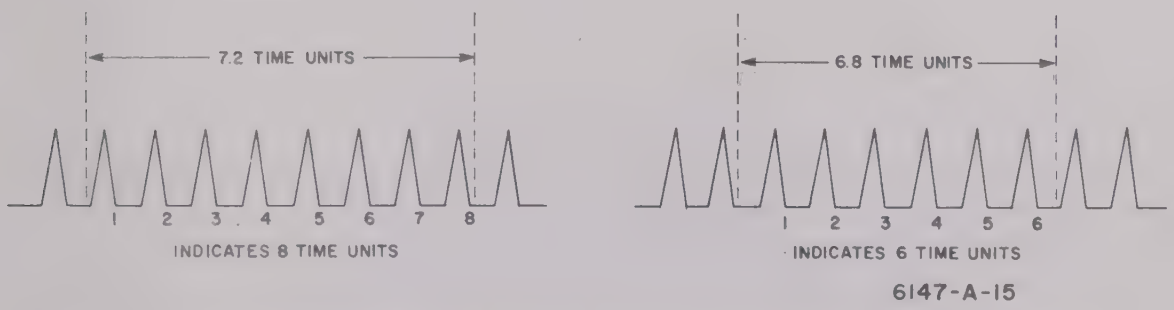


FIG. 2-14. Illustrates how gating action may cause an error of one time unit.

2.8.2 Error Due to Internal Time Standard

The internal time standard is a crystal oscillator housed in a thermostatically controlled chamber. The oscillator is subject to deviations from an absolute standard, and may change frequency during the interval between two calibrations. Once set, the oscillator will not vary

more than 2 parts in 10^8 per week. This means that measurements made within the same week can be compared with a maximum error of 0.000002 percent. If absolute (as distinguished from comparative) time is important, the oscillator may be periodically adjusted to correspond with the standard frequencies broadcast from the National Bureau of Standards radio stations, WWV or WWVH.

2.8.3 Error Due to a Non-Representative Input Signal

The instrument begins timing at the instant the input excursion passes through the trigger voltage level. If the input contains "noise" (where noise is defined as any voltage variation not representative of the event being timed), the noise may cause the input voltage to reach the trigger level too early. Figure 2-15 shows what happens if the noise is a higher frequency imposed on the ideal input signal.

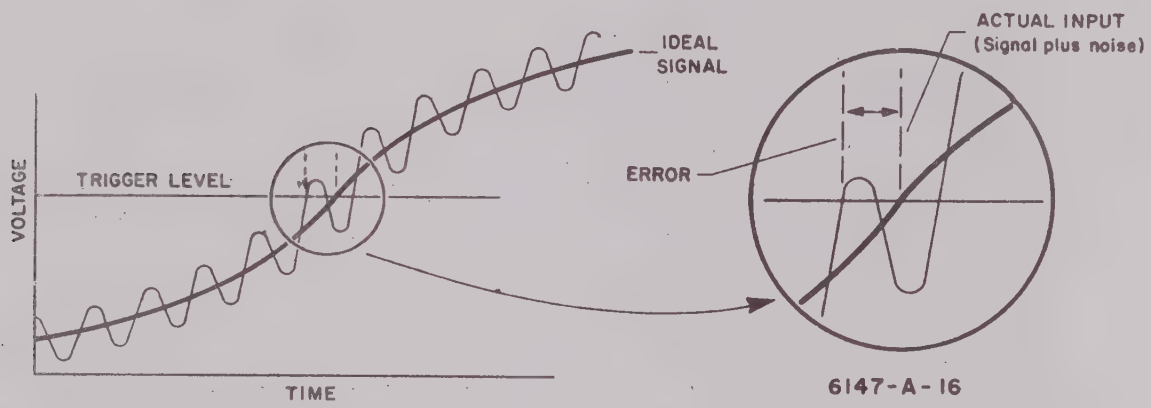


FIG. 2-15. Illustrates how noise may cause a timing error.

The best way to avoid error is to use a noise-free signal of the largest acceptable amplitude. A fast rise time will reduce the error greatly. Figure 2-16 shows that, given two voltage excursions with equal noise, the one with the faster rise time will cause less error.

FIG. 2-16. Illustrates how reducing the rise time of a signal will reduce error due to noise.

The error due to noise can be calculated by the following formula:

$$t = \frac{E_n}{S}, \text{ where}$$

t = maximum possible error in seconds

E_n = peak-to-peak noise in volts

S = slope (volts per second) of ideal signal at trigger point

2.8.4 Resolution Error

The minimum time that must elapse between events if both are to be counted is called the resolution time of the instrument. This instrument has a resolution time of better than 0.02 microseconds for frequency measurements. With the 10 mc clock available, period and interval measurements can be made with 0.1 μsecond resolution.

Resolution error becomes important when random events are counted. One such event may occur immediately after another, before the counting circuits are fully recovered and prepared to register it. The second event will not only fail to cause a count but its effect on the circuits may also cause a third event to fail to register.

2.9 AUXILIARY CONNECTORS

2.9.1 Digital Recorder Jack

This multi-terminal socket, wired to the readout lines of each storage binary, makes available 1-2-4-8 binary-coded signals for use with such auxiliary equipment as printers, display units, and data converters. Table 2-4 shows the binary code generated by the storage binaries for each decimal digit registered. A "0" means an output level of about -10 volts with respect to ground and with current limited to 0.2 ma; a "1" means a level at ground or -0.3 volts with respect to ground and with current limited to 5 ma. Table 2-5 lists the pin connections to each storage binary.

Pin 39 carries a control signal from the counter to the recorder. This pin is negative (-10 volts or more) for 50 ms, and at approximately ground potential from the time of reset until the next accessory command.

Pin 40 carries an "inhibit recycle" signal from the accessory to the counter. When this pin is grounded the instrument cannot recycle.

Pins 35 and 38 are grounded. Pins 29 through 32 are not used.

Table 2-4

FOUR-LINE BINARY CODE				
DECIMAL DIGIT REGISTERED	First Binary Stage (Weight 1)	Second Binary Stage (Weight 2)	Third Binary Stage (Weight 4)	Fourth Binary Stage (Weight 8)
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1

Use Table 2-4 to convert a coded digit to a decimal digit. Note the weight of each column in which a "1" appears, then sum the weights. For example, the coded digit "1100" is equivalent to 1+2+0+0 = 3; and "1001" is equivalent to 1+0+0+8 = 9.

Table 2-5

	PIN NO. ON DIGITAL RECORDER SOCKET			
	First Binary Stage	Second Binary Stage	Third Binary Stage	Fourth Binary Stage
Highest order digit read	Pin 37	Pin 36	Pin 34	Pin 33
2nd highest order digit	28	27	26	25
3rd highest order digit	4	3	2	1
4th highest order digit	8	7	6	5
5th highest order digit	12	11	10	9
6th highest order digit	16	15	14	13
7th highest order digit	20	19	18	17
8th highest order digit	24	23	22	21

2.9.2 TIME Jack

An output signal from the time-base generator is available at this jack. The signal is a positive-going, 0.15 μsecond pulse. These pulses are accurately spaced at the interval indicated by the TIME selector, and can be used externally as a clock signal. The output impedance is 10KΩ.

2.9.3 FREQ Jack

When the EXT-INT switch is at EXT, an external signal can be introduced at this jack to substitute for the oscillator signal. The external signal must be capable of producing 1 volt rms across 1KΩ. Frequencies from 50 kc to 2.5 mc are suitable. Frequencies below 50 kc can be used if the internal coupling capacitor is paralled by a suitable capacitor.

In INT, the oscillator frequency can be monitored.

NOTE

EXT/INT switch must be in INT position for operation of Counter unless an external clock is used.

2.9.4 SCOPE Jack

This jack connects through a 15 KΩ resistor to the gate control binary. The voltage at the jack is at ground level when the gate is closed and -10 volts with respect to ground when the gate is open.

2.10 REMOTE PROGRAMMING

Upon request, the instrument can be modified at the factory to include a DPX-57 connector for remote programming. With this modification, external control is possible for the MODE, TIME, RECYCLE RATE controls, and the SLOPE switches.

SECTION 3

SERVICING

3.1 REGULATED POWER SUPPLY ADJUSTMENT

3.1.1 General

There are four adjustments to set the +90, +15, +10, and -15 volt regulated supplies. The +90, +15, and -15 volt adjustments are located on the regulator board and the +10 volt adjustment on the EL supply board. The two boards are located at the rear of the instrument next to the power transformer (see Figure 3-1).

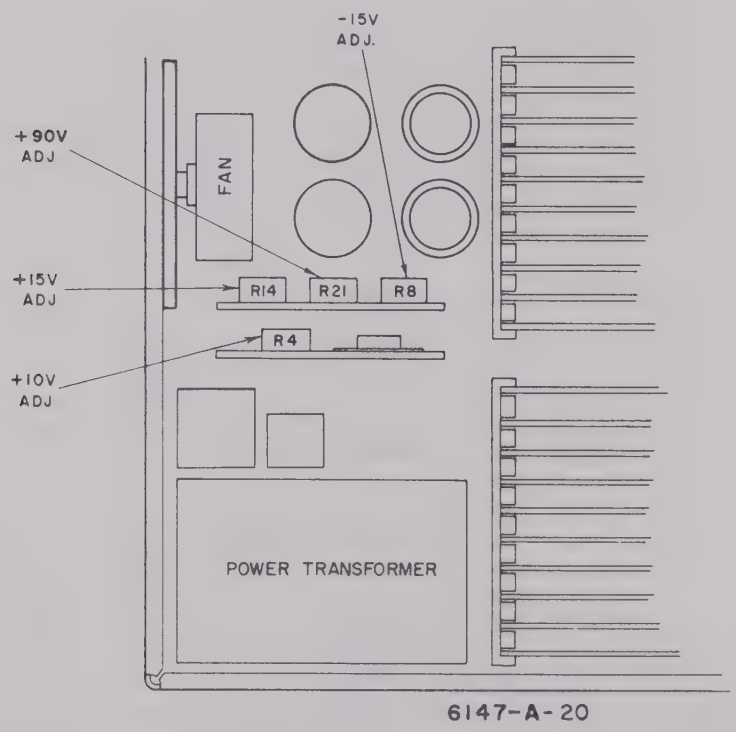


FIG. 3-1. Top view of chassis showing location of +90, +15, +10, and -15 volt adjustments.

3.1.2 Procedure

1) Use a voltmeter of at least 1% accuracy.

2) Voltage measurements are referenced to chassis ground. See Figure 3-2 for + , +15, +10, and -15 volt test points.

NOTE

> Do not remove the regulator board from its receptacle without first unplugging the ac line cord from its power source.

3) Remove regulator board from its receptacle. Insert extension board (supplied with instrument) into regulator board receptacle, and insert regulator board at the other end of extension board.

4) Adjust the (+90) potentiometer for +90 volts, ±0.1 volt (see Figures 3-1 and 3-2).

   Adjust the (+15) potentiometer for +15 volts, ±0.2 volt (see Figures 3-1 and 3-2).

   Adjust the (-15) potentiometer for -15 volts, ±0.2 volt (see Figures 3-1 and 3-2).

5) Remove extension board and return regulator board to its receptacle.

6) Remove EL supply board from its receptacle. Insert extension board into EL receptacle and plug EL supply board into other end of extension board.

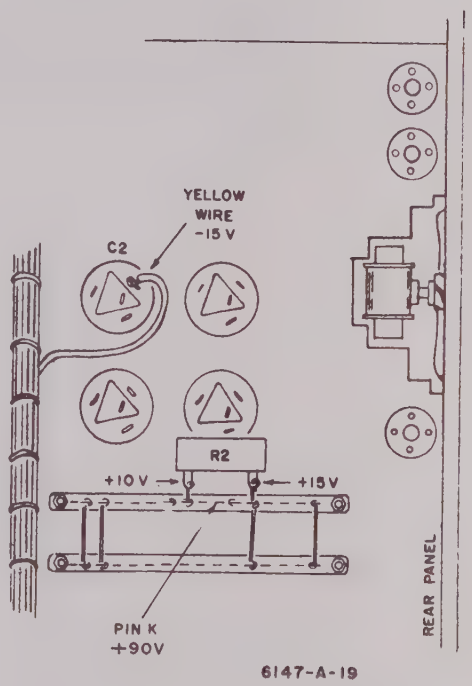


FIG. 3-2. Under chassis view showing location of +90, +15, +10, and -15 volt test points.

7) Adjust the (+10) potentiometer for +10 volts, ±0.2 volt (see Figures 3-1 and 3-2).

8) Return EL supply board to its receptacle.

3.2 OSCILLATOR ADJUSTMENT

3.2.1 Procedure

Oscillator adjustments are seldom required. When necessary use this procedure:

1) Adjustment of C1 (XTAL ADJ) and R26 (FINE FREQ. ADJ).

   a) Use Figure 3-3 to locate oscillator adjustments.

   b) Use an oscilloscope (such as Tektronix Model 531) of at least 10 megohms input impedance paralleled with approximately 15 pf; otherwise, loading may change the oscillator frequency.

   c) Connect the output from FREQ Jack J4 to the vertical input of the scope. Then, couple a 1 mc standard to the horizontal input and tune XTAL ADJ for a circular Lissajous pattern indicating equal frequencies.

   d) Use FINE FREQ ADJ to tune oscillator to exactly 1 mc.

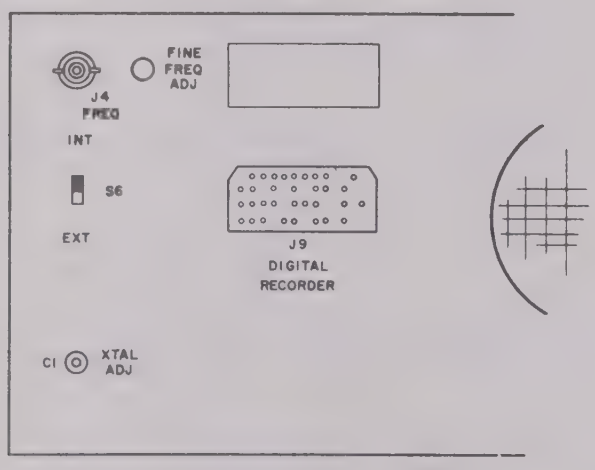


FIG. 3-3. Rear panel view showing location of Crystal Adjust (C1).

3.3 MULTIPLIER ADJUSTMENT

Use the TEST procedure (see paragraph 2.5) to make sure multiplier is operating at 10 mc frequency; if not, use adjustment procedure in paragraph 3.3.1.

3.3.1 Procedure

1) Turn MODE selector to TEST and TIME selector to 1.0 μSEC. Place scope probe on 10 mc output (pin C on Multiplier Board connector). See Figure 3-4.

2) Adjust both tunable inductors L1 and L2 for maximum output at 10 mc. Output should be at least 2.0 volts peak-to-peak. See Figure 3-5. Use a non-metallic tuning wand for adjusting L1 and L2.

NOTE

There will be 1 mc modulation of approximately 0.2 volt peak-to-peak on the 10 mc waveform.

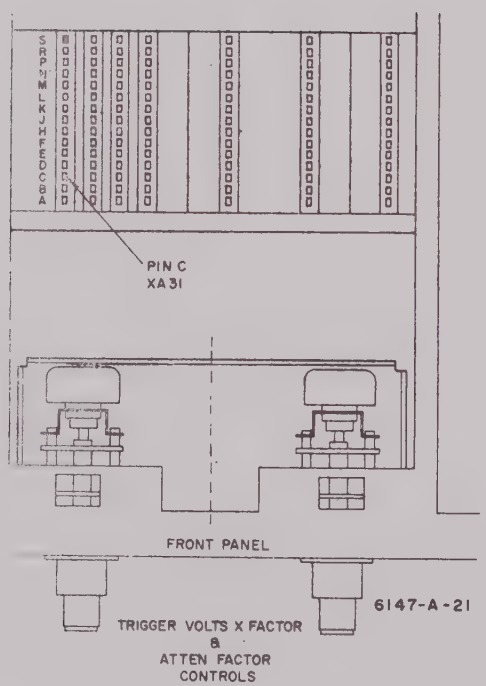


FIG. 3-4. Under chassis view showing location of 1-10 mc multiplier test point (pin C).

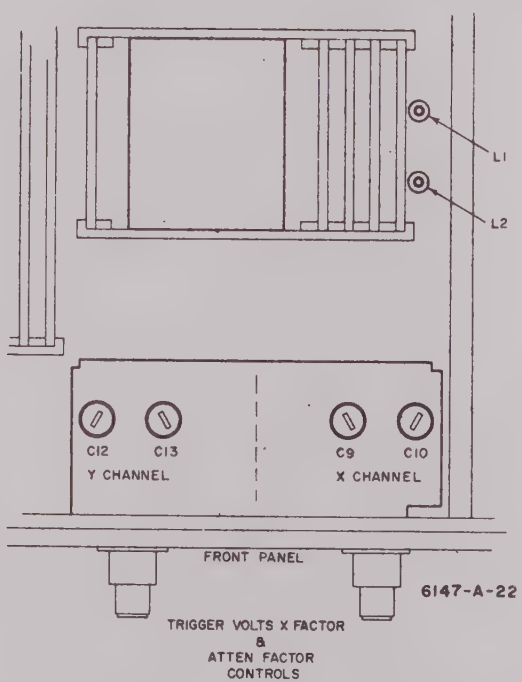


FIG. 3-5. Top view of chassis showing location of multiplier adjustments (L1 and L2), and ATTEN selector frequency compensating capacitors.

3.4 ATTENUATOR ADJUSTMENT

The two ceramic trimmer capacitors on each attenuator assembly must be adjusted to prevent the attenuator from distorting the input signal.

3.4.1 Procedure

Refer to Figure 3-5 for location of trimmer adjustments. Equipment needed: Square Wave Generator (Tektronix Type or equivalent), and an Oscilloscope (Tektronix Type 581 or equivalent).

1) Make sure both amplifier boards are in place.

2) Connect the Square Wave Generator to INPUT X. Terminate (at instrument) with a 50Ω resistor.

3) Set ATTEN selector (INPUT X) to AC 10. Apply a 2v peak-to-peak, 10kc signal to the input.

4) Monitor with an oscilloscope at pin A of XA18 (input X amplifier) the output of the attenuator. Adjust trimmer C9 for maximum flatness of the square wave.

5) Switch ATTEN selector to AC 100, and increase output of generator to 20v peak-to-peak. Adjust trimmer C10 for maximum flatness of square wave.

6) Connect the Square Wave Generator to INPUT Y. Terminate (at instrument) with a 50Ω resistor.

7) Set ATTEN selector (INPUT Y) to AC 10. Apply a 2v peak-to-peak, 10kc signal to the input.

8) Monitor with an oscilloscope at pin A of XA17 (input Y amplifier) the output of the attenuator. Adjust trimmer C12 for maximum flatness of the square wave.

9) Switch ATTEN selector to AC 100, and increase output of generator to 20v peak-to-peak. Adjust C13 for maximum flatness of square wave.

SECTION 4

PARTS LIST

NOTE

The sub-assemblies contained in this parts list are indicated as follows:

DCU Model 872	P.C. Board A1	Control	P.C. Board A28
Data Storage Unit	P.C. Boards A2, A4, A6, A8, A10, A12, A14, A16	"M" Logic	P.C. Board A29
DCU Model 862	P.C. Board A3	Time Base Logic	P.C. Board A30
DCU Model 860	P.C. Boards A5, A25	1 - 10 Mc Multiplier	P.C. Board A31
DCU Model 850	P.C. Boards A7, A9, A11, A13, A15, A19, A20, A21, A22, A23, A24	Legend	P.C. Board A32
50 Mc Input Amplifier	P.C. Boards A18, *A17	Recycle	P.C. Board A33
"S" Logic	P.C. Board A26	Regulator	P.C. Board A34
"XY" Logic	P.C. Board A27	EL Supply	P.C. Board A35
		1 Mc Precision Oscillator	P.C. Board A38
		Attenuator Switch Assembly	P.C. Board A39, *A40

* Not contained in Model 6127

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A1	887-416902	Model 872 DCU Refer to appended manual	1
A2	887-412638	Data Storage Unit (DSU) Refer to appended manual	8
A3	887-416903	Model 862 DCU Refer to appended manual	1
A4		Same as A2	
A5	887-411654	Model 860 DCU Refer to appended manual	2
A6		Same as A2	
A7	887-411653	Model 850 DCU Refer to appended manual	11
A8		Same as A2	
A9		Same as A7	
A10		Same as A2	
A11		Same as A7	
A12		Same as A2	
A13		Same as A7	
A14		Same as A2	
A15		Same as A7	
A16		Same as A2	
A17	887-416928	50 Mc Input Amplifier	2
A17C1	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	16
A17C2		Same as A17C1	
A17C3	637-824028	Capacitor, F. Mica, 1000pf, 300V, 5%	1
A17C4 thru A17C7		Same as A17C1	
A17C8	637-824008	Capacitor, F. Mica, 22pf, 300V, 5%	1
A17C9	637-824001	Capacitor, F. Mica, 5.6pf, 300V, 5%	1
A17C10 thru A17C17		Same as A17C1	
A17C18	637-824012	Capacitor, F. Mica, 47pf, 300V, 5%	1
A17C19	637-824016	Capacitor, F. Mica, 100pf, 300V, 5%	1
A17C20 & A17C21		Same as A17C1	

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A17CR1	755-815561	Diode, Silicon, 75 PIV, 10 ma, 1V min. fwd.	5
A17CR2	755-819903	Diode, Zener, 10ma, 7V, ±5%	2
A17CR3		Same as A17CR1	
A17CR4		Same as A17CR2	
A17CR5		Same as A17CR1	
A17CR6	755-817250	Diode, Germanium, 6 PIV, 200ma, 1V min. fwd.	1
A17CR7 & A17CR8		Same as A17CR1	
A17L1	795-819899	Inductor, Fixed, R.F., 0.22μh	2
A17L2		Same as A17L1	
A17Q1	755-417481	Transistor, Special	2
A17Q2		Same as A17Q1	
A17Q3	755-409895	Transistor, Special	1
A17Q4	755-823145	Transistor, Germanium, PNP, 300mw max.	3
A17Q5	755-819906	Transistor, Silicon, NPN, 300mw	4
A17Q6		Same as A17Q5	
A17Q7 & A17Q8		Same as A17Q4	
A17Q9 & A17Q10		Same as A17Q5	
A17Q11	755-819908	Transistor, Silicon, NPN, 300mw	1
A17R1	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	1
A17R2	601-823910	Resistor, F. Comp., 330K, 1/4W, 5%	1
A17R3	601-015449	Resistor, F. Comp., 1.8K, 1/2W, 5%	2
A17R4	601-000897	Resistor, F. Comp., 2.2K, 1/2W, 5%	1
A17R5	601-822366	Resistor, F. Comp., 20K, 1/4W, 5%	1
A17R6	601-008129	Resistor, F. Comp., 1.5K, 1/2W, 5%	1
A17R7	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	1
A17R8	601-822369	Resistor, F. Comp., 680Ω, 1/4W, 5%	2
A17R9	601-822328	Resistor, F. Comp., 2.2K, 1/4W, 5%	1
A17R10	601-822527	Resistor, F. Comp., 1.5K, 1/4W, 5%	2
A17R11	601-823389	Resistor, F. Comp., 68Ω, 1/4W, 5%	3

Detail No.	Beckman Stock No.	Description	Qty. / Ass'y
A17R12		Same as A17R11	
A17R13	601-823392	Resistor, F. Comp., 180Ω, 1/4W, 5%	1
A17R14	601-015038	Resistor, F. Comp., 1K, 1/2W, 5%	2
A17R15	601-822327	Resistor, F. Comp., 220Ω, 1/4W, 5%	3
A17R16	601-822371	Resistor, F. Comp., 390Ω, 1/4W, 5%	1
A17R17	601-823396	Resistor, F. Comp., 560Ω, 1/4W, 5%	1
A17R18	601-823391	Resistor, F. Comp., 150Ω, 1/4W, 5%	1
A17R19	601-822297	Resistor, F. Comp., 4.7K, 1/4W, 5%	1
A17R20		Same as A17R11	
A17R21		Same as A17R10	
A17R22	601-823390	Resistor, F. Comp., 120Ω, 1/4W, 5%	2
A17R23		Same as A17R15	
A17R24	601-823379	Resistor, F. Comp., 10Ω, 1/4W, 5%	1
A17R25		Same as A17R22	
A17R26		Same as A17R15	
A17R27		Same as A17R3	
A17R28	601-822460	Resistor, F. Comp., 3.9K, 1/4W, 5%	1
A17R29	601-822296	Resistor, F. Comp., 3.3K, 1/4W, 5%	1
A17R30	601-822334	Resistor, F. Comp., 22K, 1/4W, 5%	1
A17R31		Same as A17R14	
A17R32	601-823393	Resistor, F. Comp., 270Ω, 1/4W, 5%	2
A17R33		Same as A17R32	
A17R34		Same as A17R8	
A17R35	601-823394	Resistor, F. Comp., 330Ω, 1/4W, 5%	1
A17R36	601-823387	Resistor, F. Comp., 47Ω, 1/4W, 5%	1
A17R37	601-817735	Resistor, F. Comp., 100Ω, 1/4W, 5%	2
A17R38	601-015039	Resistor, F. Comp., 1.2K, 1/2W, 5%	1
A17R39	601-822301	Resistor, F. Comp., 15K, 1/4W, 5%	1
A17R40		Same as A17R37	
A17R41	601-015447	Resistor, F. Comp., 680Ω, 1/2W, 5%	1
	864-412958	Pad, Transistor	11
A18		Same as A17	
A19 thru A24		Same as A7	
A25		Same as A5	
A26	887-416922	"S" Logic	1
A26C1	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	7
A26C2	637-824009	Capacitor, F. Mica, 27pf, 300V, 5%	2
A26C3	637-824013	Capacitor, F. Mica, 56pf, 300V, 5%	2
A26C4 & A26C5		Same as A26C1	
A26C6	637-824007	Capacitor, F. Mica, 18pf, 300V, 5%	1
A26C7		Same as A26C1	
A26C8		Same as A26C3	
A26C9		Same as A26C1	
A26C10	637-824011	Capacitor, F. Mica, 39pf, 300V, 5%	1
A26C11		Same as A26C1	
A26C12		Same as A26C2	
A26C13		Same as A26C1	
A26C14	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	3
A26C15	637-825335	Capacitor, F. Mica, 39pf, 500V, 5%	1
A26C16 & A26C17		Same as A26C14	
A26CR1	755-815561	Diode, Silicon, 75 PIV, 10ma, 1V min. fwd.	10
A26CR2	755-828597	Diode, Germanium, 15 PIV, 10ma at 0.6V	2
A26CR3		Same as A26CR2	
A26CR4 thru A26CR8		Same as A26CR1	
A26CR9	755-824300	Diode, Germanium, Type HD1842	3
A26CR10 thru A26CR13		Same as A26CR1	
A26CR14	755-811280	Diode, Reference, Sil., 5V min. 5.5V max.	1
A26CR15 & A26CR16		Same as A26CR9	
A26Q1	755-817587	Transistor, Germanium, PNP, 150mw	2
A26Q2		Same as A26Q1	
A26Q3	755-817811	Transistor, Germanium, PNP, 0.50mw max.	2
A26Q4		Same as A26Q3	
A26Q5	755-419596	Transistor, Special	1
A26R1	601-822295	Resistor, F. Comp., 2.7K, 1/4W, 5%	1
A26R2	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	2
A26R3	601-823393	Resistor, F. Comp., 270Ω, 1/4W, 5%	3
A26R4	601-822306	Resistor, F. Comp., 820Ω, 1/4W, 5%	2
A26R5	601-817735	Resistor, F. Comp., 100Ω, 1/4W, 5%	4
A26R6		Same as A26R4	
A26R7		Same as A26R3	
A26R8	601-823394	Resistor, F. Comp., 330Ω, 1/4W, 5%	1
A26R9		Same as A26R2	
A26R10	601-822301	Resistor, F. Comp., 15K, 1/4W, 5%	4
A26R11 & A26R12		Same as A26R10	
A26R13	601-822331	Resistor, F. Comp., 8.2K, 1/4W, 5%	1
A26R14		Same as A26R10	
A26R15 & A26R16		Same as A26R5	
A26R17	601-823383	Resistor, F. Comp., 22Ω, 1/4W, 5%	1
A26R18	601-822369	Resistor, F. Comp., 6.8Ω, 1/4W, 5%	2
A26R19		Same as A26R18	
A26R20	601-823389	Resistor, F. Comp., 68Ω, 1/4W, 5%	1
A26R21	601-823395	Resistor, F. Comp., 470Ω, 1/4W, 5%	1
A26R22	601-823396	Resistor, F. Comp., 560Ω, 1/4W, 5%	1
A26R23		Same as A26R3	
A26R24		Same as A26R5	
A26R25	601-823386	Resistor, F. Comp., 39Ω, 1/4W, 5%	1
A26T1	792-419863	Toroidal Assembly	1
A27	887-416925	"XY" Logic	1
A27C1	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	8
A27C2	637-824009	Capacitor, F. Mica, 27pf, 300V, 5%	2
A27C3		Same as A27C1	
A27C4		Same as A27C2	
A27C5		Same as A27C1	
A27C6	637-824010	Capacitor, F. Mica, 33pf, 300V, 5%	4
A27C7		Same as A27C1	
A27C8		Same as A27C6	
A27C9		Same as A27C1	
A27C10		Same as A27C6	
A27C11		Same as A27C1	
A27C12		Same as A27C6	
A27C13 & A27C14		Same as A27C1	
A27CR1	755-824300	Diode, Germanium, Type HD1842	12
A27CR2 thru A27CR12		Same as A27CR1	

Detail No.	Beckman Stock No.	Description	Qty. Ass'y
A27R1	601-822331	Resistor, F. Comp., 8.2K, 1/4W, 5%	6
A27R2 thru A27R6		Same as A27R1	
A27R7	601-823396	Resistor, F. Comp., 560Ω, 1/4W, 5%	1
A27R8	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	1
A28	887-416919	Control	1
A28C1	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	6
A28C2	637-824001	Capacitor, F. Mica, 5.6pf, 300V, 5%	1
A28C3 thru A28C5		Same as A28C1	
A28C6	637-824008	Capacitor, F. Mica, 22pf, 300V, 5%	4
A28C7		Same as A28C1	
A28C8 thru A28C10		Same as A28C6	
A28C11	637-824012	Capacitor, F. Mica, 47pf, 300V, 5%	1
A28C12	637-824023	Capacitor, F. Mica, 390pf, 300V, 5%	1
A28C13		Same as A28C1	
A28CR1	755-817250	Diode, Germanium, 6PIV, 200ma, 1V min. fwd.	10
A28CR2 thru A28CR10		Same as A28CR1	
A28CR11	755-819903	Diode, Zener, 7V, 5%	1
A28Q1	755-415036	Transistor, Special	4
A28Q2		Same as A28Q1	
A28Q3	755-817811	Transistor, Germanium, PNP, 150mw	4
A28Q4		Same as A28Q3	
A28Q5 & A28Q6		Same as A28Q1	
A28Q7	755-800398	Transistor, Germanium, PNP, 150mw max.	1
A28Q8 & A28Q9		Same as A28Q3	
A28Q10	755-819906	Transistor, Silicon, NPN, 300mw	1
A28R1	601-823396	Resistor, F. Comp., 560Ω, 1/4W, 5%	2
A28R2	601-822328	Resistor, F. Comp., 2.2K, 1/4W, 5%	4
A28R3	601-822369	Resistor, F. Comp., 680Ω, 1/4W, 5%	1
A28R4	601-823395	Resistor, F. Comp., 470Ω, 1/4W, 5%	2
A28R5	601-015446	Resistor, F. Comp., 470Ω, 1/2W, 5%	2
A28R6	601-015442	Resistor, F. Comp., 150Ω, 1/2W, 5%	4
A28R7		Same as A28R5	
A28R8		Same as A28R4	
A28R9		Same as A28R2	
A28R10	601-822301	Resistor, F. Comp., 15K, 1/4W, 5%	2
A28R11	601-822297	Resistor, F. Comp., 4.7K, 1/4W, 5%	1
A28R12		Same as A28R1	
A28R13	601-822527	Resistor, F. Comp., 1.5K, 1/4W, 5%	1
A28R14	601-022939	Resistor, F. Comp., 220Ω, 1/2W, 5%	1
A28R15	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	3
A28R16		Same as A28R15	
A28R17		Same as A28R2	
A28R18	601-822326	Resistor, F. Comp., 1.2K, 1/4W, 5%	1
A28R19		Same as A28R10	
A28R20	601-822295	Resistor, F. Comp., 2.7K, 1/4W, 5%	2
A28R21		Same as A28R20	
A28R22	601-822306	Resistor, F. Comp., 822Ω, 1/4W, 5%	2
A28R23		Same as A28R6	
A28R24	601-012028	Resistor, F. Comp., 47Ω, 1/2W, 5%	1
A28R25		Same as A28R6	

Detail No.	Beckman Stock No.	Description	Qty. Ass'y
A28R26		Same as A28R22	
A28R27	601-823394	Resistor, F. Comp., 330Ω, 1/4W, 5%	1
A28R28	601-015038	Resistor, F. Comp., 1K, 1/2W, 5%	2
A28R29	601-822334	Resistor, F. Comp., 22K, 1/4W, 5%	4
A28R30		Same as A28R29	
A28R31	601-822296	Resistor, F. Comp., 3.3K, 1/4W, 5%	2
A28R32		Same as A28R28	
A28R33		Same as A28R6	
A28R34		Same as A28R15	
A28R35	601-822397	Resistor, F. Comp., 5.6K, 1/4W, 5%	1
A28R36	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	1
A28R37		Same as A28R2	
A28R38		Same as A28R29	
A28R39		Same as A28R31	
A28R40	601-817735	Resistor, F. Comp., 100Ω, 1/4W, 5%	1
A28R41	601-823390	Resistor, F. Comp., 120Ω, 1/4W, 5%	1
A28R42	601-823383	Resistor, F. Comp., 22Ω, 1/4W, 5%	1
A28R43		Same as A28R29	
A28R44	601-823379	Resistor, F. Comp., 10Ω, 1/4W, 5%	1
	864-412958	Pad, Transistor	10
A29	887-416904	"M" Logic	1
A29C1	637-824018	Capacitor, F. Mica, 150pf, 300V, 5%	1
A29C2	637-824016	Capacitor, F. Mica, 100pf, 300V, 5%	1
A29C4	637-824024	Capacitor, F. Mica, 470pf, 300V, 5%	1
A29C5	637-824020	Capacitor, F. Mica, 220pf, 300V, 5%	1
A29C6	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	1
A29C7	637-824022	Capacitor, F. Mica, 330pf, 300V, 5%	12
A29C8 thru A29C18		Same as A29C7	
A29CR1	755-402107	Diode, Special	20
A29CR2		Same as A29CR1	
A29CR3	755-824300	Diode, Germanium, Type HD1842	1
A29CR4		Same as A29CR1	
A29CR5	755-404593	Diode, Special	12
A29CR6		Same as A29CR5	
A29CR7 thru A29CR9		Same as A29CR1	
A29CR10 & A29CR11		Same as A29CR5	
A29CR12 thru A29CR14		Same as A29CR1	
A29CR15 & A29CR16		Same as A29CR5	
A29CR17 thru A29CR19		Same as A29CR1	
A29CR20 & A29CR21		Same as A29CR5	
A29CR22 thru A29CR24		Same as A29CR1	
A29CR25 & A29CR26		Same as A29CR5	
A29CR27 thru A29CR29		Same as A29CR1	
A29CR30 & A29CR31		Same as A29CR5	
A29CR32 & A29CR33		Same as A29CR1	

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A29Q1	755-817811	Transistor, Germanium, PNP, 150mw	2
A29Q2		Same as A29Q1	
A29Q3	755-800398	Transistor, Germanium, PNP, 150mw max.	7
A29Q4	755-817587	Transistor, Germanium, PNP, 150mw	2
A29Q5		Same as A29Q4	
A29Q6 thru A29Q11		Same as A29Q3	
A29R1	601-823107	Resistor, F. Comp., 15K, 1/4W, 10%	13
A29R2	601-823944	Resistor, F. Comp., 5.6K, 1/4W, 10%	2
A29R3		Same as A29R2	
A29R4	601-812856	Resistor, F. Comp., 2.2K, 1/4W, 10%	1
A29R5	601-823937	Resistor, F. Comp., 680Ω, 1/4W, 10%	3
A29R7	601-822527	Resistor, F. Comp., 1.5K, 1/4W, 5%	1
A29R8		Same as A29R5	
A29R9	601-823108	Resistor, F. Comp., 10K, 1/4W, 10%	1
A29R10		Same as A29R5	
A29R11	601-823110	Resistor, F. Comp., 22K, 1/4W, 10%	1
A29R12	601-823112	Resistor, F. Comp., 1.5K, 1/4W, 10%	3
A29R13	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	1
A29R14	601-822333	Resistor, F. Comp., 12K, 1/4W, 5%	1
A29R15		Same as A29R12	
A29R16	601-823931	Resistor, F. Comp., 150Ω, 1/4W, 10%	1
A29R17		Same as A29R12	
A29R18	601-812741	Resistor, F. Comp., 100K, 1/4W, 10%	6
A29R19 & A29R20		Same as A29R1	
A29R21		Same as A29R18	
A29R22 & A29R23		Same as A29R1	
A29R24		Same as A29R18	
A29R25 & A29R26		Same as A29R1	
A29R27		Same as A29R18	
A29R28 & A29R29		Same as A29R1	
A29R30		Same as A29R18	
A29R31 & A29R32		Same as A29R1	
A29R33		Same as A29R18	
A29R34 & A29R35		Same as A29R1	
A29R36	601-823939	Resistor, F. Comp., 1.2K, 1/4W, 10%	1
	864-412958	Pad, Transistor	11
A30	887-411674	Time Base Logic	1
A30C1	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	2
A30C2	637-824018	Capacitor, F. Mica, 150pf, 300V, 5%	6
A30C3	637-824020	Capacitor, F. Mica, 220pf, 300V, 5%	1
A30C4 thru A30C6		Same as A30C2	
A30C7		Same as A30C1	
A30C8 & A30C9		Same as A30C2	
A30C10	637-824012	Capacitor, F. Mica, 47pf, 300V, 5%	2
A30C11		Same as A30C10	
A30C12	637-824011	Capacitor, F. Mica, 39pf, 300V, 5%	1
A30CR1	755-402107	Diode, Special	8
A30CR2		Same as A30CR1	
A30CR3	755-824300	Diode, Germanium, Type HD1842	2
A30CR4 & A30CR5		Same as A30CR1	

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A30CR6		Same as A30CR3	
A30CR7 thru A30CR10		Same as A30CR1	
A30CR11	755-815561	Diode, Silicon, 75 PIV, 10ma, 1V min. fwd.	1
A30Q1	755-817811	Transistor, Germanium, PNP, 150mw	2
A30Q2		Same as A30Q1	
A30Q3	755-800398	Transistor, Germanium, PNP, 150mw max.	1
A30R1	601-823107	Resistor, F. Comp., 15K, 1/4W, 10%	8
A30R2	601-815239	Resistor, F. Comp., 4.7K, 1/4W, 10%	8
A30R3	601-823104	Resistor, F. Comp., 390Ω, 1/4W, 10%	1
A30R4	601-822296	Resistor, F. Comp., 3.3K, 1/4W, 5%	1
A30R5		Same as A30R1	
A30R6		Same as A30R2	
A30R7	601-822299	Resistor, F. Comp., 6.8K, 1/4W, 5%	1
A30R8		Same as A30R2	
A30R9	601-823937	Resistor, F. Comp., 680Ω, 1/4W, 10%	2
A30R10		Same as A30R1	
A30R11		Same as A30R2	
A30R12		Same as A30R1	
A30R13		Same as A30R9	
A30R14	601-823942	Resistor, F. Comp., 3.3K, 1/4W, 10%	2
A30R15		Same as A30R1	
A30R16		Same as A30R2	
A30R17		Same as A30R1	
A30R18		Same as A30R2	
A30R19		Same as A30R1	
A30R20		Same as A30R2	
A30R21		Same as A30R1	
A30R22	601-823951	Resistor, F. Comp., 47K, 1/4W, 10%	1
A30R23		Same as A30R2	
A30R24	601-823112	Resistor, F. Comp., 1.5K, 1/4W, 10%	2
A30R25		Same as A30R24	
A30R26		Same as A30R14	
	864-412958	Pad, Transistor	3
A31	887-412605	1 - 10 Mc Multiplier	1
A31C1	639-007467	Capacitor, F. Paper, 0.1μf, 400V, 20%	1
A31C2	633-811290	Capacitor, F. Cerm., 47pf, 600V	2
A31C3		Same as A31C2	
A31C4	633-824213	Capacitor, F. Cerm., 2.2pf, 600V, 10%	1
A31C5	637-824010	Capacitor, F. Mica, 33pf, 300V, 5%	1
A31C6	633-811287	Capacitor, F. Cerm., 6.8pf, 600V, 10%	1
A31C7	637-824017	Capacitor, F. Mica, 120pf, 300V, 5%	1
A31C8	637-824024	Capacitor, F. Mica, 470pf, 300V, 5%	1
A31C9	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	3
A31C10 & A31C11		Same as A31C9	
A31CR1	755-409096	Diode, Type 1N198, w/Point Contact	2
A31CR2		Same as A31CR1	
A31L1	792-411964	Inductor	1
A31L2	792-411965	Inductor	1
A31Q1	755-823113	Transistor, Silicon, NPN, 800mw max.	1
A31R1	601-822327	Resistor, F. Comp., 220Ω, 1/4W, 5%	1
A31R2	601-822328	Resistor, F. Comp., 2.2K, 1/4W, 5%	1
A31R3	601-823371	Resistor, F. Comp., 390Ω, 1/4W, 5%	2
A31R4		Same as A31R3	
A31R5	601-823395	Resistor, F. Comp., 470Ω, 1/4W, 5%	1
	864-412958	Pad, Transistor	1

Detail No.	Beckman Stock No.	Description	Qty. / Ass'y
A32	887-418075	Legend	1
A32C1	637-824020	Capacitor, F. Mica, 220pf, 300V, 5%	2
A32C2	631-814053	Capacitor, F. Elect., 1μf, 35V, 20%	1
A32C3	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	3
A32C4		Same as A32C1	
A32C5 & A32C6		Same as A32C3	
A32CR1	755-815561	Diode, Silicon, 75PIV, 10ma, 1V min. fwd.	4
A32CR2 thru A32CR4		Same as A32CR1	
A32CR5	755-404593	Diode, Special	1
A32DS1	825-414955	Lamp, Neon, Special	6
A32DS2 thru A32DS6		Same as A32DS1	
A32Q1	755-800398	Transistor, Germanium, PNP, 150mw max.	2
A32Q2		Same as A32Q1	
A32Q3	755-410066	Transistor, Special	3
A32Q4	755-817964	Transistor, Silicon, NPN, 600mw max.	1
A32Q5 & A32Q6		Same as A32Q3	
A32R1	601-822337	Resistor, F. Comp., 91K, 1/4W, 5%	6
A32R2 thru A32R6		Same as A32R1	
A32R7	601-824112	Resistor, F. Comp., 2.7M, 1/4W, 10%	4
A32R8		Same as A32R7	
A32R9	601-824831	Resistor, F. Comp., 2.2M, 1/4W, 10%	1
A32R10 & A32R11		Same as A32R7	
A32R12	601-824832	Resistor, F. Comp., 1.5M, 1/4W, 10%	1
A32R13	601-823951	Resistor, F. Comp., 47K, 1/4W, 10%	6
A32R14 thru A32R18		Same as A32R13	
A32R19	601-823112	Resistor, F. Comp., 1.5K, 1/4W, 10%	3
A32R20	601-822334	Resistor, F. Comp., 22K, 1/4W, 5%	1
A32R21		Same as A32R19	
A32R22	601-823944	Resistor, F. Comp., 5.6K, 1/4W, 10%	2
A32R23		Same as A32R22	
A32R24	601-823110	Resistor, F. Comp., 22K, 1/4W, 10%	1
A32R25	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	1
A32R26	601-823107	Resistor, F. Comp., 15K, 1/4W, 10%	3
A32R27	601-823109	Resistor, F. Comp., 33K, 1/4W, 10%	2
A32R28	601-815239	Resistor, F. Comp., 4.7K, 1/4W, 10%	2
A32R29	601-823954	Resistor, F. Comp., 82K, 1/4W, 10%	1
A32R30	601-823945	Resistor, F. Comp., 6.8K, 1/4W, 10%	2
A32R31		Same as A32R30	
A32R32	601-823948	Resistor, F. Comp., 18K, 1/4W, 10%	1
A32R33		Same as A32R19	
A32R34		Same as A32R28	
A32R35		Same as A32R26	
A32R36	601-822295	Resistor, F. Comp., 2.7K, 1/4W, 5%	1
A32R37		Same as A32R26	
A32R38		Same as A32R27	
A32V1	753-416278	Photo-Resistor, End-View, Special	6
A32V2 thru A32V6		Same as A32V1	
	824-414475	Lamp, Block, Cover	1
	824-412922	Lamp, Block, Base	1
	864-412958	Pad, Transistor	6

Detail No.	Beckman Stock No.	Description	Qty. / Ass'y
A33	887-411673	Recycle	1
A33C1	637-824020	Capacitor, F. Mica, 220pf, 300V, 5%	17
A33C2	637-824024	Capacitor, F. Mica, 470pf, 300V, 5%	4
A33C3		Same as A33C2	
A33C4 & A33C5		Same as A33C1	
A33C6	637-824022	Capacitor, F. Mica, 330pf, 300V, 5%	1
A33C7 & A33C8		Same as A33C1	
A33C9		Same as A33C2	
A33C10	631-819463	Capacitor, F. Elect. 3.3μf, 15V, 10%	1
A33C11	637-824018	Capacitor, F. Mica, 150pf, 300V, 5%	2
A33C12 & A33C13		Same as A33C1	
A33C14	637-824027	Capacitor, F. Mica, 820pf, 300V, 5%	1
A33C15		Same as A33C2	
A33C16		Same as A33C1	
A33C17	631-828102	Capacitor, F. Elect., 4.7μf, 100V	1
A33C18	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	3
A33C19 thru A33C23		Same as A33C1	
A33C24		Same as A33C18	
A33C25		Same as A33C1	
A33C26		Same as A33C11	
A33C27		Same as A33C1	
A33C28		Same as A33C18	
A33C29		Same as A33C1	
A33C30	631-814053	Capacitor, F. Elect., 1μf, 35V, 20%	1
A33C31		Same as A33C1	
A33C32	637-824028	Capacitor, F. Mica, 1000pf, 300V, 5%	1
A33CR1	755-404593	Diode, Special	27
A33CR2 thru A33CR5		Same as A33CR1	
A33CR6	755-402107	Diode, Special	3
A33CR7 thru A33CR13		Same as A33CR1	
A33CR14		Same as A33CR6	
A33CR15 thru A33CR21		Same as A33CR1	
A33CR22		Same as A33CR6	
A33CR23 thru A33CR30		Same as A33CR1	
A33DS1	825-414955	Lamp, Neon, Special	1
A33Q1	755-800398	Transistor, Germanium, PNP, 150mw max.	23
A33Q2 thru A33Q12		Same as A33Q1	
A33Q13	755-410066	Transistor, Special	1
A33Q14 thru A33Q24		Same as A33Q1	
A33R1	601-823949	Resistor, F. Comp., 27K, 1/4W, 10%	1
A33R2	601-823942	Resistor, F. Comp., 3.3K, 1/4W, 10%	10
A33R3	601-823948	Resistor, F. Comp., 18K, 1/4W, 10%	2
A33R4	601-823944	Resistor, F. Comp., 5.6K, 1/4W, 10%	2
A33R5	601-823109	Resistor, F. Comp., 33K, 1/4W, 10%	7
A33R6	601-823108	Resistor, F. Comp., 10K, 1/4W, 10%	13
A33R7		Same as A33R2	
A33R8	601-822334	Resistor, F. Comp., 22K, 1/4W, 5%	6
A33R9	601-823933	Resistor, F. Comp., 220Ω, 1/4W, 10%	2

Detail No.	Beckman Stock No.	Description	Qty. / Ass'y
A33R10	601-823107	Resistor, F. Comp., 15K, 1/4W, 10%	3
A33R11	601-823951	Resistor, F. Comp., 47K, 1/4W, 10%	2
A33R12		Same as A33R2	
A33R13 thru A33R15		Same as A33R6	
A33R16	601-823110	Resistor, F. Comp., 22K, 1/4W, 10%	8
A33R17	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	5
A33R18	601-823112	Resistor, F. Comp., 1.5K, 1/4W, 10%	13
A33R19		Same as A33R8	
A33R20		Same as A33R18	
A33R21	601-823931	Resistor, F. Comp., 150Ω, 1/4W, 10%	2
A33R22		Same as A33R18	
A33R23		Same as A33R6	
A33R24		Same as A33R17	
A33R25		Same as A33R16	
A33R26		Same as A33R18	
A33R27		Same as A33R8	
A33R28		Same as A33R18	
A33R29		Same as A33R5	
A33R30		Same as A33R10	
A33R31		Same as A33R5	
A33R32		Same as A33R2	
A33R33		Same as A33R17	
A33R34		Same as A33R16	
A33R35		Same as A33R18	
A33R36		Same as A33R8	
A33R37		Same as A33R6	
A33R38		Same as A33R18	
A33R39	601-823923	Resistor, F. Comp., 33Ω, 1/4W, 10%	1
A33R40		Same as A33R18	
A33R41		Same as A33R3	
A33R42		Same as A33R4	
A33R43		Same as A33R5	
A33R44		Same as A33R2	
A33R45		Same as A33R8	
A33R46		Same as A33R9	
A33R47		Same as A33R11	
A33R48 & A33R49		Same as A33R2	
A33R50		Same as A33R6	
A33R51	601-823945	Resistor, F. Comp., 6.8K, 1/4W, 10%	2
A33R52		Same as A33R16	
A33R53	601-815239	Resistor, F. Comp., 4.7K, 1/4W, 10%	1
A33R54	601-812856	Resistor, F. Comp., 2.2K, 1/4W, 10%	1
A33R55	601-823944	Resistor, F. Comp., 5.6K, 1/4W, 5%	1
A33R56	601-043210	Resistor, F. Comp., 12K, 1W, 5%	1
A33R57 & A33R58		Same as A33R5	
A33R59	601-823947	Resistor, F. Comp., 12K, 1/4W, 10%	1
A33R60		Same as A33R2	
A33R61		Same as A33R6	
A33R62	601-822333	Resistor, F. Comp., 12K, 1/4W, 5%	1
A33R63		Same as A33R5	
A33R64		Same as A33R2	
A33R65 thru A33R67		Same as A33R6	
A33R68		Same as A33R17	
A33R69		Same as A33R16	
A33R70		Same as A33R18	
A33R71		Same as A33R8	
A33R72		Same as A33R18	
A33R73		Same as A33R21	
A33R74		Same as A33R18	
A33R75		Same as A33R16	
A33R76		Same as A33R17	
A33R77		Same as A33R18	
A33R78		Same as A33R16	
A33R79	601-823929	Resistor, F. Comp., 100Ω, 1/4W, 10%	2
A33R80		Same as A33R18	
A33R81		Same as A33R6	
A33R82	601-812742	Resistor, F. Comp., 220K, 1/4W, 10%	1
A33R83		Same as A33R79	
A33R84		Same as A33R6	
A33R85		Same as A33R2	
A33R86		Same as A33R51	
A33R87		Same as A33R16	
A33R88		Same as A33R10	
	864-412958	Pad, Transistor	24
A34	887-412442	Regulator	1
A34C1	631-814053	Capacitor, F. Elect., 1μf, 35V, 20%	2
A34C2		Same as A34C1	
A34CR1	755-404593	Diode, Silicon, Special	2
A34CR2	755-824951	Diode, Zener, 400mw	2
A34CR3		Same as A34CR1	
A34CR4		Same as A34CR2	
A34Q1	755-811274	Transistor, Type 2N445A	2
A34Q2	755-800398	Transistor, Germanium, PNP, 150mw max.	4
A34Q3		Same as A34Q2	
A34Q4		Same as A34Q1	
A34Q5 & A34Q6		Same as A34Q2	
A34Q7	755-415078	Transistor, Special	1
A34R1	601-823934	Resistor, F. Comp., 270Ω, 1/4W, 10%	2
A34R2	601-008065	Resistor, F. Comp., 100Ω, 1/2W, 10%	1
A34R3	601-823104	Resistor, F. Comp., 390Ω, 1/4W, 10%	2
A34R4	601-823105	Resistor, F. Comp., 470Ω, 1/4W, 10%	2
A34R5	601-823112	Resistor, F. Comp., 1.5K, 1/4W, 10%	1
A34R6	601-008059	Resistor, F. Comp., 2.2K, 1W, 10%	2
A34R7	601-815239	Resistor, F. Comp., 4.7K, 1/4W, 10%	2
A34R8	611-812861	Resistor, V. W. W., 200Ω, 1-1/2W, 20%	2
A34R9	601-008071	Resistor, F. Comp., 330Ω, 1/2W, 10%	2
A34R10		Same as A34R1	
A34R11	601-008068	Resistor, F. Comp., 180Ω, 1/2W, 10%	1
A34R12		Same as A34R4	
A34R13		Same as A34R3	
A34R14		Same as A34R8	
A34R15		Same as A34R6	
A34R16		Same as A34R7	
A34R17		Same as A34R9	
A34R18	601-812856	Resistor, F. Comp., 2.2K, 1/4W, 10%	1
A34R19	601-800143	Resistor, F. Comp., 3.3K, 2W, 5%	1
A34R20	601-822296	Resistor, F. Comp., 3.3K, 1/4W, 5%	1
A34R21	611-812860	Resistor, V. W. W., 2000Ω, 1.50W, 20%	1
A34R22	601-016229	Resistor, F. Comp., 1.5K, 1W, 5%	1
A34R23	601-800132	Resistor, F. Comp., 680Ω, 2W, 5%	1
A34R24	601-043215	Resistor, F. Comp., 18K, 1W, 5%	1
	864-412958	Pad, Transistor	6

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A35	887-412795	EL Supply	1
A35C1	631-824631	Capacitor, F. Elect., 10μf, 20V, 20%	1
A35C2	631-802980	Capacitor, F. Elect., 22μf, 25V, 20%	1
A35C3	631-828130	Capacitor, F. Elect., 150μf, 15V, 10%	1
A35Q1	755-824875	Transistor, Germanium, PNP, 63W	2
A35Q2		Same as A35Q1	
A35Q3	755-800398	Transistor, Germanium, PNP, 150mw max.	2
A35Q4		Same as A35Q3	
A35R1	601-800031	Resistor, F. Comp., 470Ω, 1/2W, 10%	2
A35R2	601-823917	Resistor, F. Comp., 10Ω, 1/4W, 10%	1
A35R3		Same as A35R1	
A35R4	611-812861	Resistor, V. W. W., 200Ω, 1.5W, 20%	1
A35R5	601-008071	Resistor, F. Comp., 330Ω, 1/2W, 10%	1
A35R6	601-008068	Resistor, F. Comp., 180Ω, 1/2W, 10%	1
A35R7	601-010684	Resistor, F. Comp., 3.3K, 1/2W, 10%	1
A35R8	601-007932	Resistor, F. Comp., 10K, 1/2W, 10%	1
A35R9	601-823935	Resistor, F. Comp., 330Ω, 1/4W, 10%	1
A35R10	604-819969	Resistor, F. W. W., 1.5Ω, 1/2W, 5%	1
	864-412958	Pad, Transistor	2

855-435210

A38	855-411635	1 Mc Precision Oscillator	1
A38C1	655-824658	Capacitor, V. Glass, 0.6-14pf, 1000V	1
A38C2	633-824491	Capacitor, F. Cerm., NPO, 39pf, 600V, 10%	1
A38C3	637-819380	Capacitor, F. Dip Mica, 150pf, 300V, 5%	1
A38C4	637-824825	Capacitor, F. Dip Mica, 3000pf, 300V, 5%	1
A38C5	637-819381	Capacitor, F. Dip Mica, 560pf, 300V, 5%	1
A38C6	631-802980	Capacitor, F. Tantalum, 22μf, 25V, ±20%	5
A38C7		Same as A38C6	
A38C8	637-824025	Capacitor, F. Dip Mica, 560pf, 300V	3
A38C9	637-824303	Capacitor, F. Dip Mica, 3900pf, 300V	2
A38C10	637-824302	Capacitor, F. Dip Mica, 300pf, 300V	2
A38C11	637-824028	Capacitor, F. Dip Mica, 1000pf, 300V	2
A38C12		Same as A38C8	
A38C13		Same as A38C10	
A38C14		Same as A38C11	
A38C16	637-824018	Capacitor, F. Mica, 150pf, 300V	1
A38C17	633-804715	Capacitor, F. Cerm., 0.01μf, 50V	4
A38C18		Same as A38C8	
A38C19 & A38C20		Same as A38C17	
A38C21		Same as A38C9	
A38C22		Same as A38C17	
A38C23	633-815873	Capacitor, F. Cerm., 0.33μf, 25V	1
A38C51 & A38C52		Same as A38C6	
A38C53	651-815767	Capacitor, F. Mylar, 0.01μf, 400V dc	1
A38C54		Same as A38C6	
A38C60	633-817465	Capacitor, Cerm., Temp. Stable, 0.0047μf	1
A38CR1	755-811280	Diode, Reference, 5.5V, Zener	1
A38CR2	755-402107	Diode, Germanium, 1N95	2
A38CR51		Same as A38CR2	
A38L1	795-807916	Coil, 470μh	2
A38L2		Same as A38L1	
A38L3	795-827337	Coil, 6.8μh, ±10%, 0.40Ω, max.	1
A38L4	795-411966	Choke, 10mh, ±2%	1
A38L51	795-405551	Choke, Toroid. 1h	1

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A38Q1	755-823113	Transistor, Type 2N2219	2
A38Q2	755-817964	Transistor, Type 2N1420	1
A38Q3	755-817216	Transistor, Type 2N502A	2
A38Q4		Same as A38Q3	
A38Q5	755-817811	Transistor, Type 2N961	2
A38Q6		Same as A38Q5	
A38Q7		Same as A38Q1	
A38Q51	755-817964	Transistor, Type 2N1420	2
A38Q52		Same as A38Q51	
A38Q53	755-822107	Transistor, Power, Type 2N1544	2
A38Q54		Same as A38Q53	
A38R1	601-822324	Resistor, F. Comp., 10K, 1/4W, 5%	3
A38R2		Same as A38R1	
A38R3	601-822397	Resistor, F. Comp., 5.6K, 1/4W, 5%	1
A38R4	601-015446	Resistor, F. Comp., 470Ω, 1/2W, 5%	1
A38R5		Same as A38R1	
A38R6	601-822333	Resistor, F. Comp., 12K, 1/4W, 5%	2
A38R7	601-822326	Resistor, F. Comp., 1.2K, 1/4W, 5%	2
A38R8	601-822308	Resistor, F. Comp., 1K, 1/4W, 5%	1
A38R9	601-822295	Resistor, F. Comp., 2.7K, 1/4W, 5%	3
A38R10	601-822299	Resistor, F. Comp., 6.8K, 1/4W, 5%	2
A38R11	601-822328	Resistor, F. Comp., 2.2K, 1/4W, 5%	2
A38R12		Same as A38R11	
A38R13		Same as A38R9	
A38R14		Same as A38R10	
A38R15		Same as A38R6	
A38R16	601-822544	Resistor, F. Comp., 1.8K, 1/4W, 5%	1
A38R17	601-822306	Resistor, F. Comp., 820Ω, 1/4W, 5%	4
A38R18	601-817735	Resistor, F. Comp., 100Ω, 1/4W, 5%	1
A38R19		Same as A38R9	
A38R20	601-822327	Resistor, F. Comp., 220Ω, 1/4W, 5%	1
A38R21		Same as A38R17	
A38R22		Same as A38R7	
A38R23	601-822527	Resistor, F. Comp., 1.5K, 1/4W, 5%	1
A38R24 & A38R25		Same as A38R17	
A38R26	611-806216	Resistor, V. W. W., 200Ω, 10%, 1/4W	1
A38R27	601-823383	Resistor, F. Comp., 22Ω, 1/4W, 5%	1
A38R51	601-079172	Resistor, F. Comp., 820Ω, 1/2W, 5%	1
A38R52	601-022930	Resistor, F. Comp., 100Ω, 1/2W, 5%	2
A38R53	601-015447	Resistor, F. Comp., 680Ω, 1/2W, 5%	1
A38R54		Same as A38R52	
A38R55	601-800011	Resistor, F. Comp., 270Ω, 1/2W, 5%	1
A38R56	601-008129	Resistor, F. Comp., 1.5K, 1/2W, 5%	1
A38R57	601-000897	Resistor, F. Comp., 2.2K, 1/2W, 5%	1
A38R58	601-800001	Resistor, F. Comp., 2.7Ω, 1/2W, 5%	1
A38R59		Resistor, Factory Selected Value	1
A38S1	805-815845	Thermoswitch, Fixed Open at 70°C.	1
A38T51	792-410696	Transformer, Driver	1
A38T52	792-410697	Transformer, Output	1
A38Y1	881-405017	Crystal	1
	695-815672	Terminal, Feed Thru	10
	678-817326	Header, 7-Pin	1
	860-824225	Socket, 9-Pin Min. Teflon Insulated	1

Detail No.	Beckman Stock No.	Description	Qty./ Ass'y
A39	855-414681	Attenuator Switch Assembly	2
A39C2	633-804718	Capacitor, F. Cerm., 0.01μf, 600V	1
A39C3	637-807481	Capacitor, F. Mica, 5pf, 500V, 5%	1
A39C5	637-824028	Capacitor, F. Dip. Mica, 1000pf, 300V, 5%	1
A39R1	601-015081	Resistor, F. Comp., 180K, 1/2W, 5%	1
A39R2	601-002209	Resistor, F. Comp., 2M, 1/2W, 5%	1
A39R3	601-000899	Resistor, F. Comp., 4.7K, 1/2W, 5%	2
A39R4	614-414678	Potentiometer, 2.5K, ±10%	1
A39R5		Same as A39R3	
A39S1	711-414679	Attenuator Switch Spec. Assembly	1
	010-414062	Attenuator Switch Spec. 7 Pos., 2 Sec.	1
A40		Same as A39	
A41	711-413778	Reset, Recycle Rate Assembly	1
A42	887-413050	Plug-In, Model 696	1
C1	631-412828	Capacitor, F. Elect., 1500μf, 30V	3
C2 & C3		Same as C1	
C4	631-410854	Capacitor, F. Elect., 300μf, 150V	1
C5	633-804717	Capacitor, F. Cerm., 0.01μf, 500V	2
C6		Same as C5	
C7	637-824008	Capacitor, F. Mica, 22pf, 300V 5%	1
C8	651-827327	Capacitor, F. Mylar, 1μf, 600V	2
C9	643-805005	Capacitor, F. Cerm., 5-25pf, 350V	4
C10		Same as C9	
C11		Same as C8	
C12 & C13		Same as C9	
CR1	774-824971	Rectifier Bridge, 3 amps	1
CR2	774-824972	Rectifier Bridge, 1.5 amps	2
CR3		Same as CR2	
CR4	755-404593	Diode, Special	1
DS1	824-824973	Lamp, Neon, Plug-In Cartridge	1
DS2	823-412941	Readout, EL, Eight Digit	1
E1	778-413840	Amplifier Shield	1
F1	731-801567	Fuse, Electrical, 1.5 amp, 125V, Time Delay	1
J1	670-806738	Connector, Coaxial, Receptacle, BNC type	4
J2 thru J4		Same as J1	
J5	683-817991	Jack, Banana, Red Nylon	1
J6	672-824946	Connector, Receptacle, 50-pin Contacts	2
J7		Same as J6	
J9	672-806833	Connector, Receptacle, 40 Female Contacts	1
K1	718-827701	Relay, 12V, 4 Form C	1
Q1	755-822107	Transistor, Germanium, PNP, 2 ma, max.	3
Q2 & Q3		Same as Q1	
Q4	755-415078	Transistor, Special	1
R1	601-800018	Resistor, F. Comp., 10Ω, 1/2W, 10%	1
R2	604-801990	Resistor, F.W.W., 10Ω, 5W, 10%	1
R3	601-822371	Resistor, F. Comp., 390Ω, 1/4W, 5%	1
R4	601-823923	Resistor, F. Comp., 33Ω, 1/4W, 10%	1
R5	601-823921	Resistor, F. Comp., 22Ω, 1/4W, 10%	1
R6	601-823109	Resistor, F. Comp., 33K, 1/4W, 10%	1
R7	601-823111	Resistor, F. Comp., 1K, 1/4W, 10%	1
R8	601-800132	Resistor, F. Comp., 680Ω, 2W, 5%	1
S1	711-412989	Switch, 14 Pos., 4 Sec., Type 7141R	1
S2	711-413605	Switch, 14 Pos., 7 Sec.	1
S3	701-806040	Switch, Toggle, DPDT, 3 amp at 250V ac	1
S4	701-806039	Switch, Toggle, SPDT, 1 amp at 250V ac	1
S5	711-413785	Switch, Rotary, Oak Type F	1
S6	716-827410	Switch, Slide DPDT	1
T1	792-411294	Transformer, Power	1
T2	792-411415	Transformer, EL	1
XA1	680-824871	Connector, Printed Circuit, 15 contacts	42
XA2A & XA2B		Same as XA1	
XA3		Same as XA1	
XA4A & XA4B		Same as XA1	
XA5		Same as XA1	
XA6A & XA6B		Same as XA1	
XA7		Same as XA1	
XA8A & XA8B		Same as XA1	
XA9		Same as XA1	
XA10A & XA10B		Same as XA1	
XA11		Same as XA1	
XA12A & XA12B		Same as XA1	
XA13		Same as XA1	
XA14A & XA14B		Same as XA1	
XA15		Same as XA1	
XA16A & XA16B		Same as XA1	
XA17		Same as XA1	
XA18		Same as XA1	
XA19		Same as XA1	
XA20		Same as XA1	
XA21		Same as XA1	
XA22		Same as XA1	
XA23		Same as XA1	
XA24		Same as XA1	
XA25		Same as XA1	
XA26		Same as XA1	
XA27		Same as XA1	
XA28		Same as XA1	
XA29	680-824115	Connector, Printed Circuit, 30 contacts	2
XA30		Same as XA29	
XA31		Same as XA1	
XA32A & XA32B		Same as XA1	
XA33A & XA33B		Same as XA1	
XDS1	824-824974	Socket, Lamp Cartridge Mounting	1
XDS2	697-412938	Socket, 8 Digit Electroluminescent Panel	1
XE1		Same as XA1	
XF1	735-007268	Fuseholder, 15 amp at 250V Breakdown	1
XK1	860-824956	Socket, Relay	1
Z1	711-416479	Filter, Interference	1

Detail No.	Beckman Stock No.	Description	Qty. Ass'y
	842-819209	Fan Motor	1
	776-411321	Heat Sink	1
	776-827328	Heat Sink	1
	864-806361	Insulator, Transistor Mtg., Aluminum	2
	327-824957	Retainer, Relay Socket	1
	241-824552	Fan Blade 4" Nylon	1
	132-824977	Clip, Retainer, Indicator Lamp	1
	664-812450	Cordset, Elect., Power, 3 Cond., Black, 6 feet	1
	325-413171	Knob, Round, Skirted	2
	317-413693	Hinge, Handle	2
	325-413174	Knob, Round, Skirted, Concentric Base	2
	325-415351	Knob. Power	1
	325-415350	Knob, Attenuator	2
	325-415335	Knob, Display	1
	330-413694	Handle, Cast	1
	327-413153	Bracket, Plug-In	1
	405-413714	Pin, Guide	1
	778-412944	EL Shield	1
	337-416959	Shield, Safety	1
	327-416380	Bracket Attenuator Capacitor	2
	302-413692	Spring, Handle	2
	297-413696	Bottom Dust Cover	1
	297-413615	Top Cover	1
	778-415115	Shield, Attenuator	1
	349-414969	Tilt Foot	1
	716-413516	Reset Button	1
	670-828653	Connector, BNC Type	2
	327-411656	Printed Circuit Board Holder	8
	327-414796	Printed Circuit Board Holder	4
	327-414710	Modification, P.C. Board Holder	1

MODIFICATIONS
MODEL 6100 SERIES

MODIFICATION AA

This modification substitutes a medium-stability oscillator (3 parts in 10^7 per week) for the precision oscillator (2 parts in 10^8 per week) in 25 mc and 50 mc 6100 Series instruments. Refer to schematic diagram No. C411996.

Specifications for the medium-stability oscillator are as follows:

Frequency: 1 megacycle.

Stability: 3 parts in 10^7 per week with ±10% line variation and ±10 degrees C temperature variation.

Short Term: 3 parts in 10^9 per 24 hours average; 1 part in 10^9 standard deviation.

MODIFICATION AB

In instruments with Modification AB, a high-stability oscillator (2 parts in 10^8 per week) replaces the medium-stability oscillator. This modification affects 2.5 mc 6100 Series instruments. Refer to schematic diagrams C412391 and C412392.

Specifications for the high-stability oscillator are as follows:

Frequency: 1 megacycle.

Stability:

Long Term: 2 parts in 10^8 per week average; 5 parts in 10^9 standard deviation.

MODIFICATION AC

With Modification AC the high-stability oscillator is supplied with a Certificate of Stability. This certificate includes such information as serial number of the oscillator unit, date of certification, and standard to which the unit was certified.

Oscillator circuitry is identical to that used in Modification AB.

MODIFICATION AD

Instruments with Modification AD have a DPX-57 connector added to the rear panel for remote programming. With this modification external control is possible for the MODE, TIME, RECYCLE RATE, RESET, and SLOPE controls. Unit Logic for the AD Modification in 2.5 mc and 25 mc instruments (Models 6124, 6144, 6126, and 6146) is shown in schematic diagram No. D421974. Drawing No. C418543 shows the required switching.

Unit Logic for 50 mc instruments (Models 6127, 6147) is shown in Drawing No. D418542. Drawing No. C418543 shows the required switching.

A Model 6100 Series instrument can be programmed with either contact closures or transistor switching. However, if the instrument is used with a plug-in (other than Basic Plug-in) contact closures must be used. If transistor switching is desired, contact the factory.

MODIFICATION AE

This modification provides 20 inch-travel slides for rack mounting.

MODIFICATION AF

This modification permits the instrument to be used with a 400 cps power source rather than the standard 60 cps. Except for the replacement of the 60 cps fan motor with a 400 cps motor, there are no circuit changes.

MODIFICATION AG

With this modification, front panel connectors for INPUT's X and Y are paralleled with connectors on the rear panel. This modification applies to the basic instrument only, and it is not available on plug-in modules.

MODIFICATION AH

Instruments with this modification have a 222 volt primary instead of the standard 117 volt. Figure 1 shows the AH Modification.

The 222 volt transformer can be converted to 117 volt operation by rewiring as shown in Figure 2.

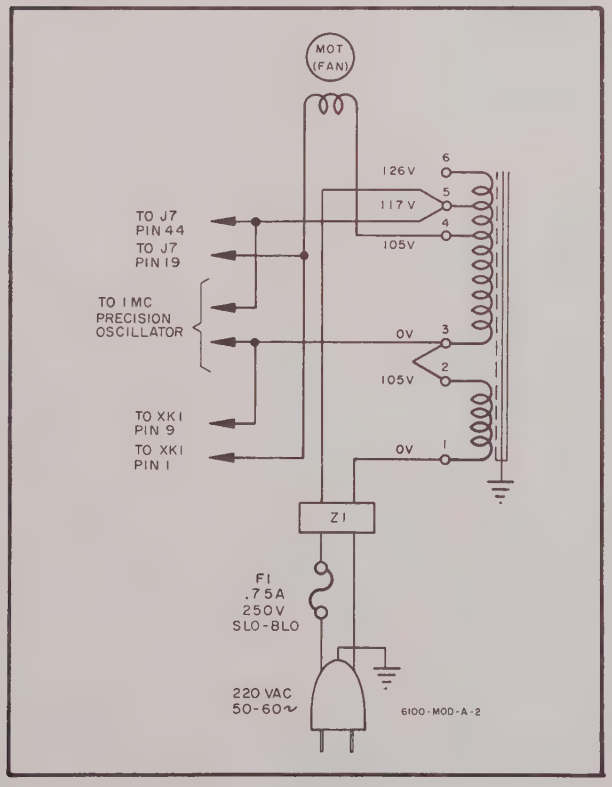


FIG. 1. 222 Volt Primary.

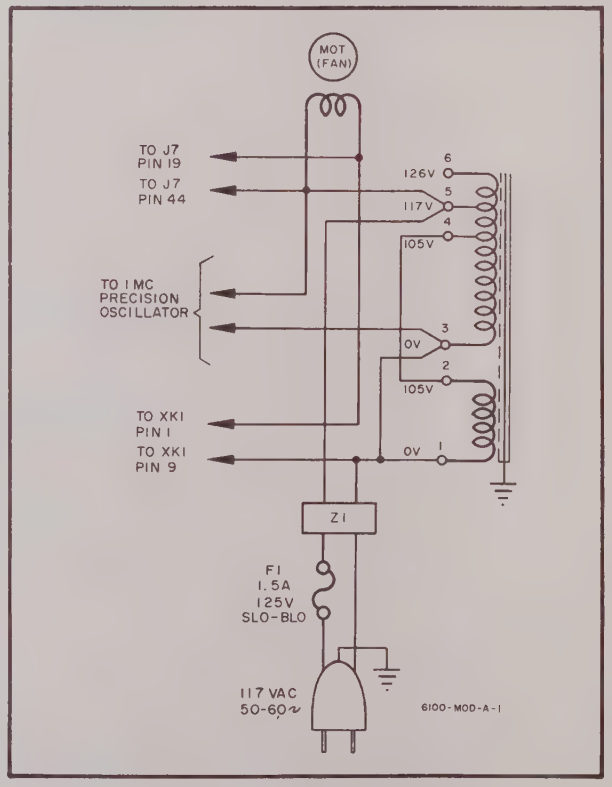
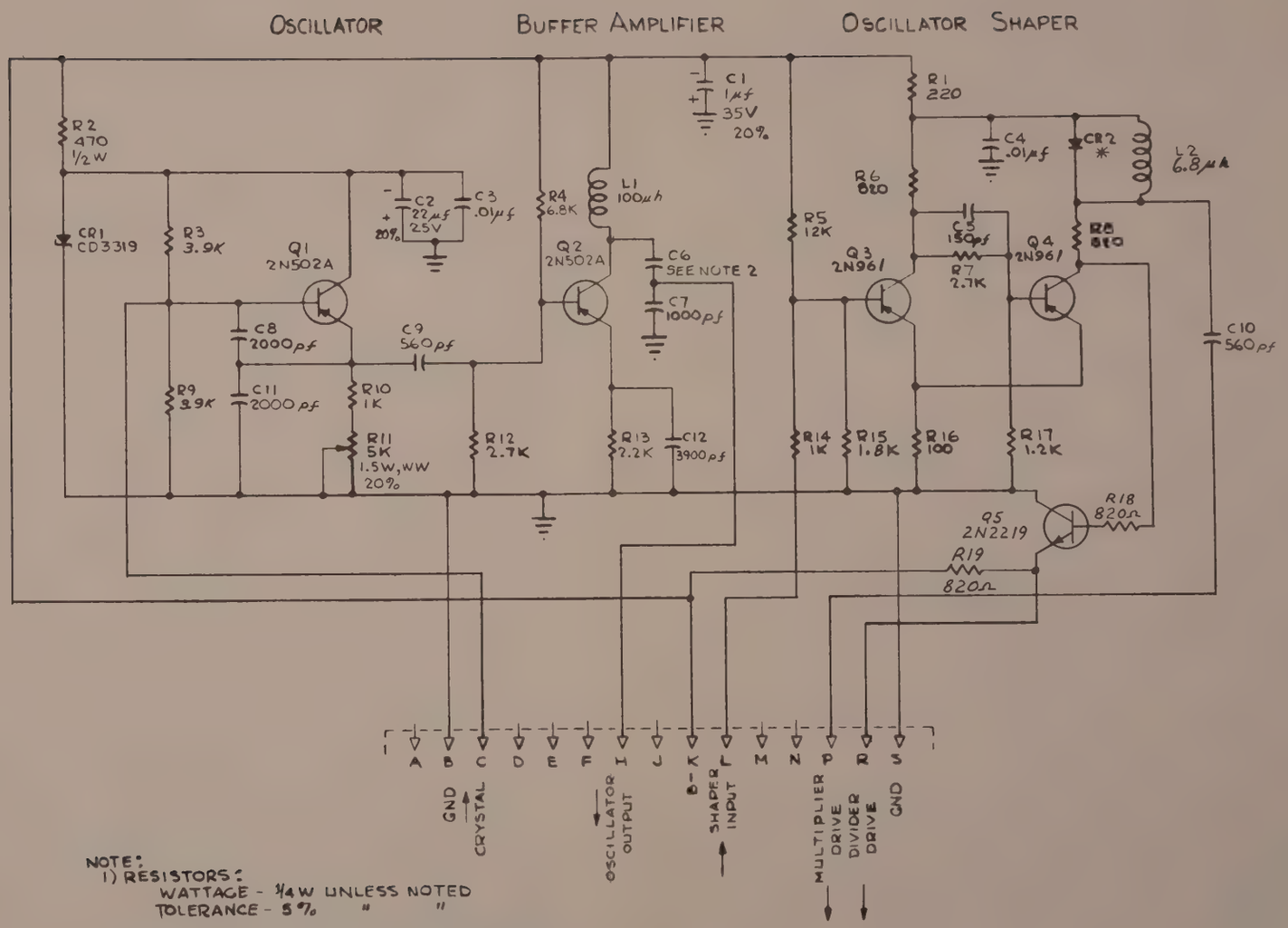


FIG. 2. 117 Volt Primary.

MOD. AA - 6100 SERIES
1 MC OSCILLATOR & SHAPER
SCHEMATIC DIAGRAM



NOTE:
1) RESISTORS:
WATTAGE - 1/4 W UNLESS NOTED
TOLERANCE - 5% " "

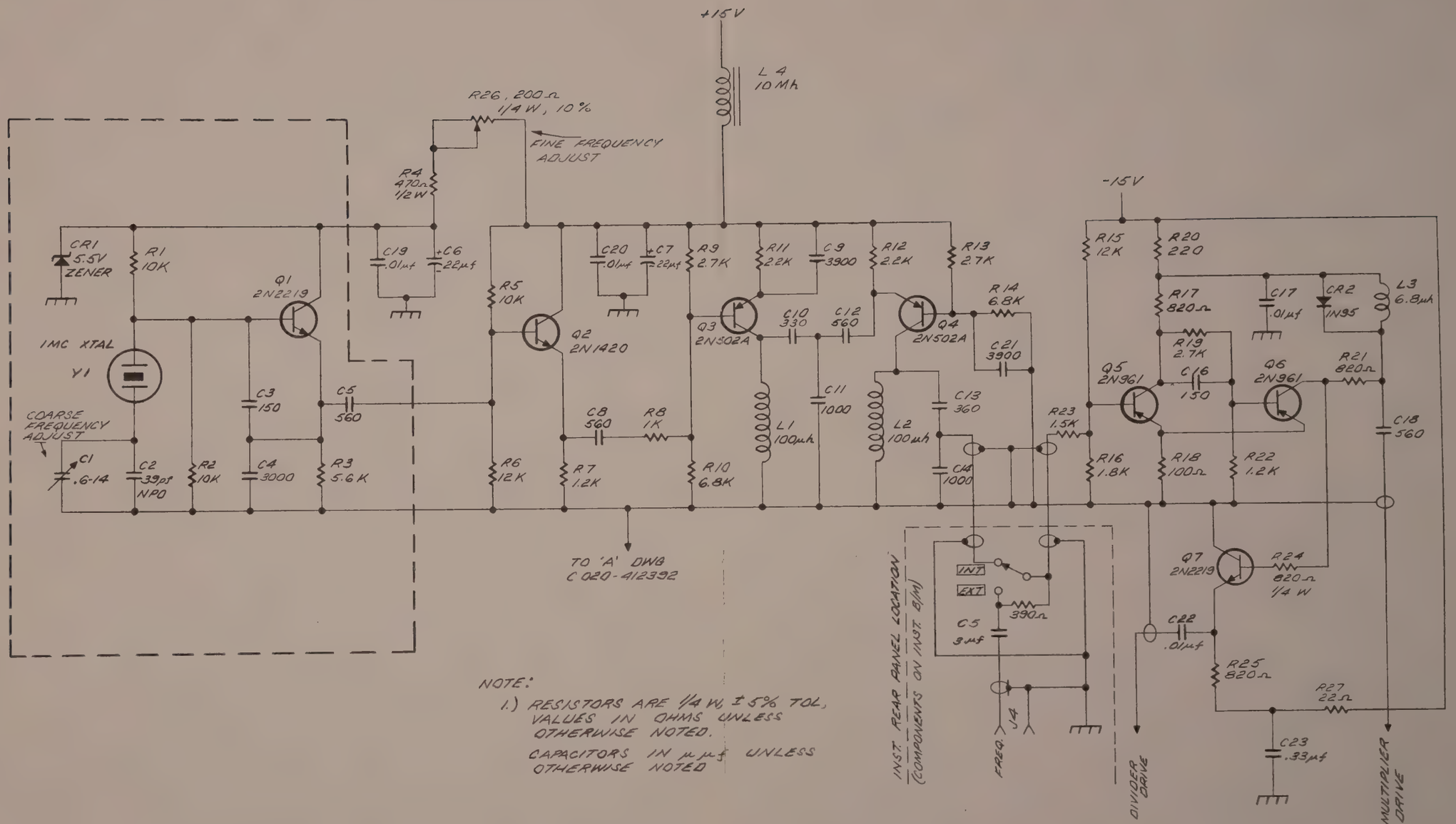
2) C6 NOMINALLY 300pf. IF OSCILLATOR OUTPUT IS LESS THAN 3V PP, CHANGE TO 330pf

3) CAPACITORS:
TOLERANCE - 5% UNLESS NOTED
VOLTAGE - 300V " "

4) .01µf DISC ARE -20+80%, 500V

* 5) CR2 IS BDB #755-402107

MOD. AB - 6100 SERIES
1 MC PRECISION OSCILLATOR
SCHEMATIC DIAGRAM



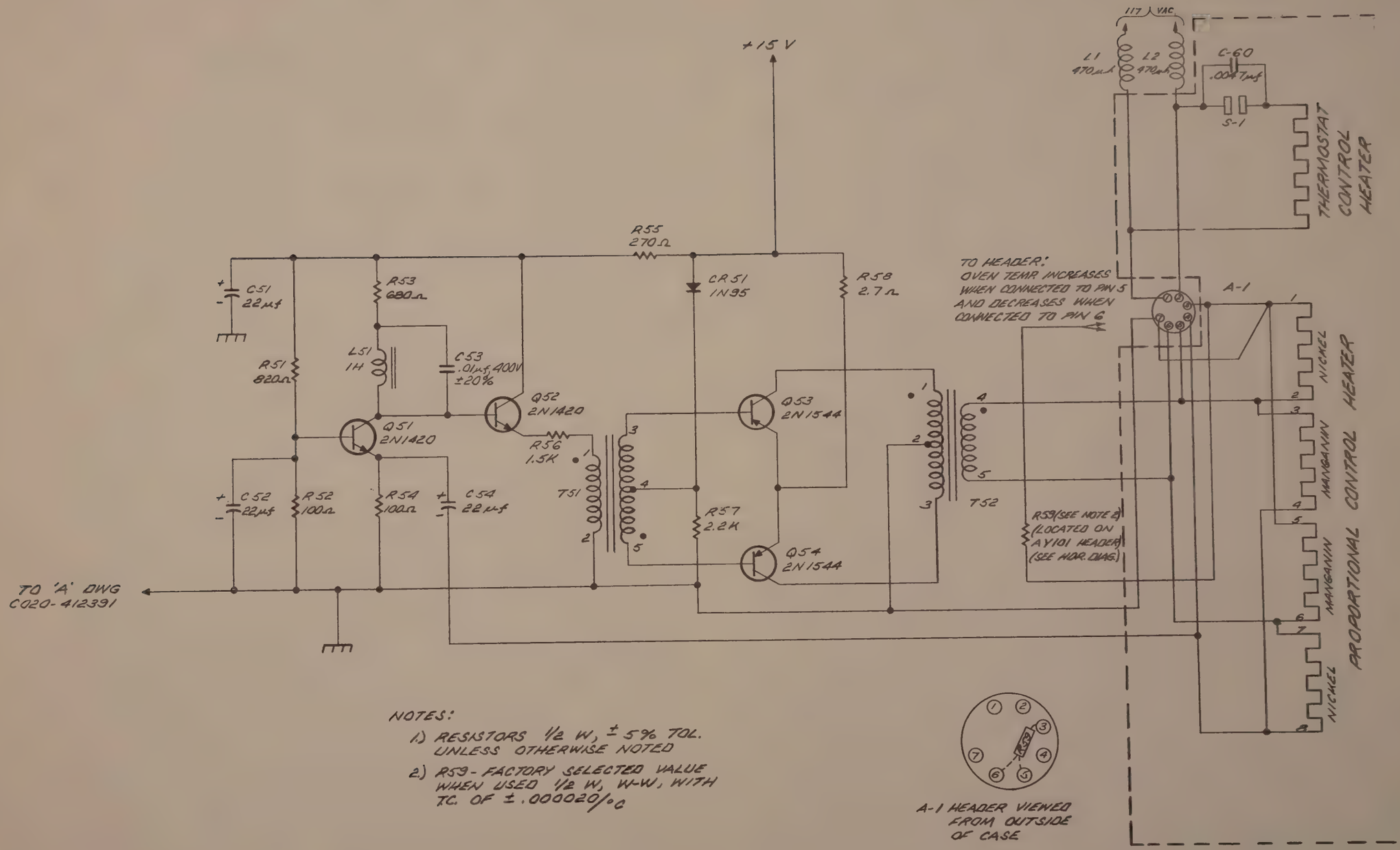
NOTE:

1.) RESISTORS ARE 1/4 W, ± 5% TOL, VALUES IN OHMS UNLESS OTHERWISE NOTED.

CAPACITORS IN μμf UNLESS OTHERWISE NOTED

Beckman

MOD. AB - 6100 SERIES
OVEN CONTROL
SCHEMATIC DIAGRAM 3



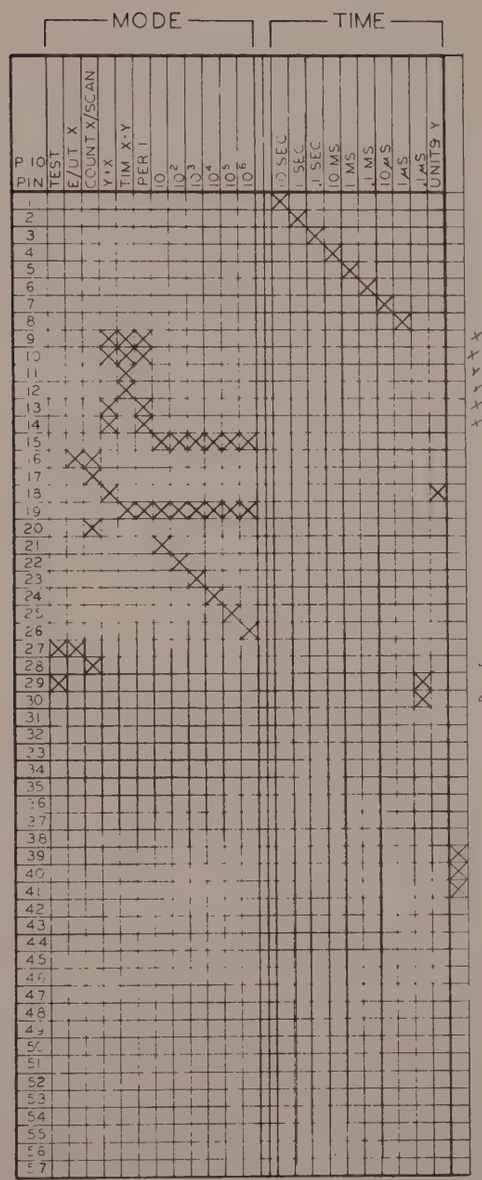
NOTES:

1.) RESISTORS 1/2 W, ± 5% TOL. UNLESS OTHERWISE NOTED

2.) R59 - FACTORY SELECTED VALUE WHEN USED 1/2 W, W-W, WITH T.C. OF ± .000020/°C

A-1 HEADER VIEWED FROM OUTSIDE OF CASE

MOD. AD - 6100 SERIES
REMOTE PROGRAM MATRIX
SCHEMATIC DIAGRAM 4

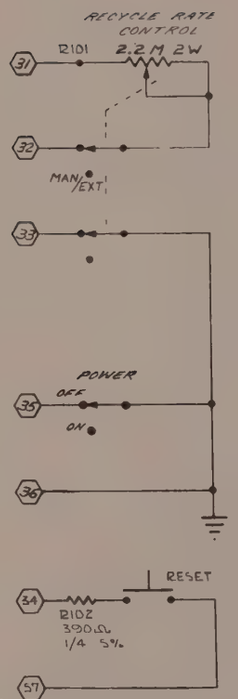


X START + SLOPE
X START − "
Y STOP + "
Y STOP − "
X STOP + "
X STOP − "
} SELECT 1

START COUNT 601/602 ONLY

0.1 µS GATE TIME 601, 602 ONLY

FORM C ARM
N.O. CONTACT (+ POLARITY)
N.C. CONTACT (− POLARITY)
} SEE NOTE #5.



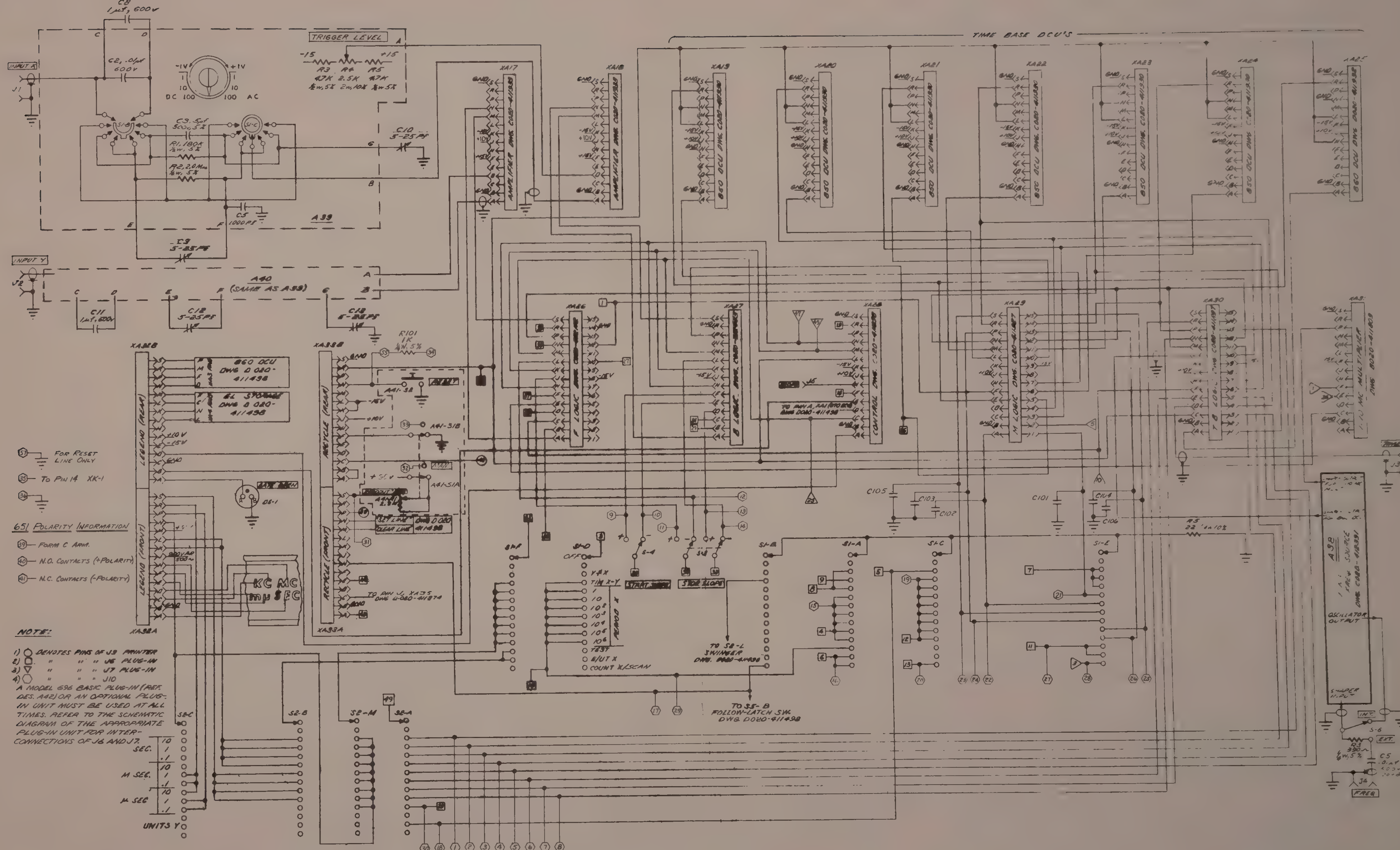
NOTE:

1. USE .1 µS ONLY IN TIM X-Y, PER X.
2. SEE INSTRUCTION MANUAL TABLE 2-2 FOR INCOMPATABLE MATRIX COMBINATION.
3. ☒ TIE THIS PIN TO SIGNAL GND (PIN 36)
   EXAMPLE:
   IF E/UT X, @ 1 MS TIME BASE ARE SELECTED, GROUND PINS 5, 16 & 27.
4. IF A TRANSISTOR SWITCH IS USED FOR #3 ABOVE, IT MUST BE OPERATED IN THE SATURATED CONDITION, TURNED ON. (PNP)
5. THIS POLARITY INFORMATION IS AVAILABLE ONLY WHEN 651 PLUG-IN IS EMPLOYED.

MOD. AD--6100 Series
C 418543-Rev. C
January 1965

Beckman®

MOD. AD - 6100 SERIES
UNIT LOGIC - REMOTE
SCHEMATIC DIAGRAM 5

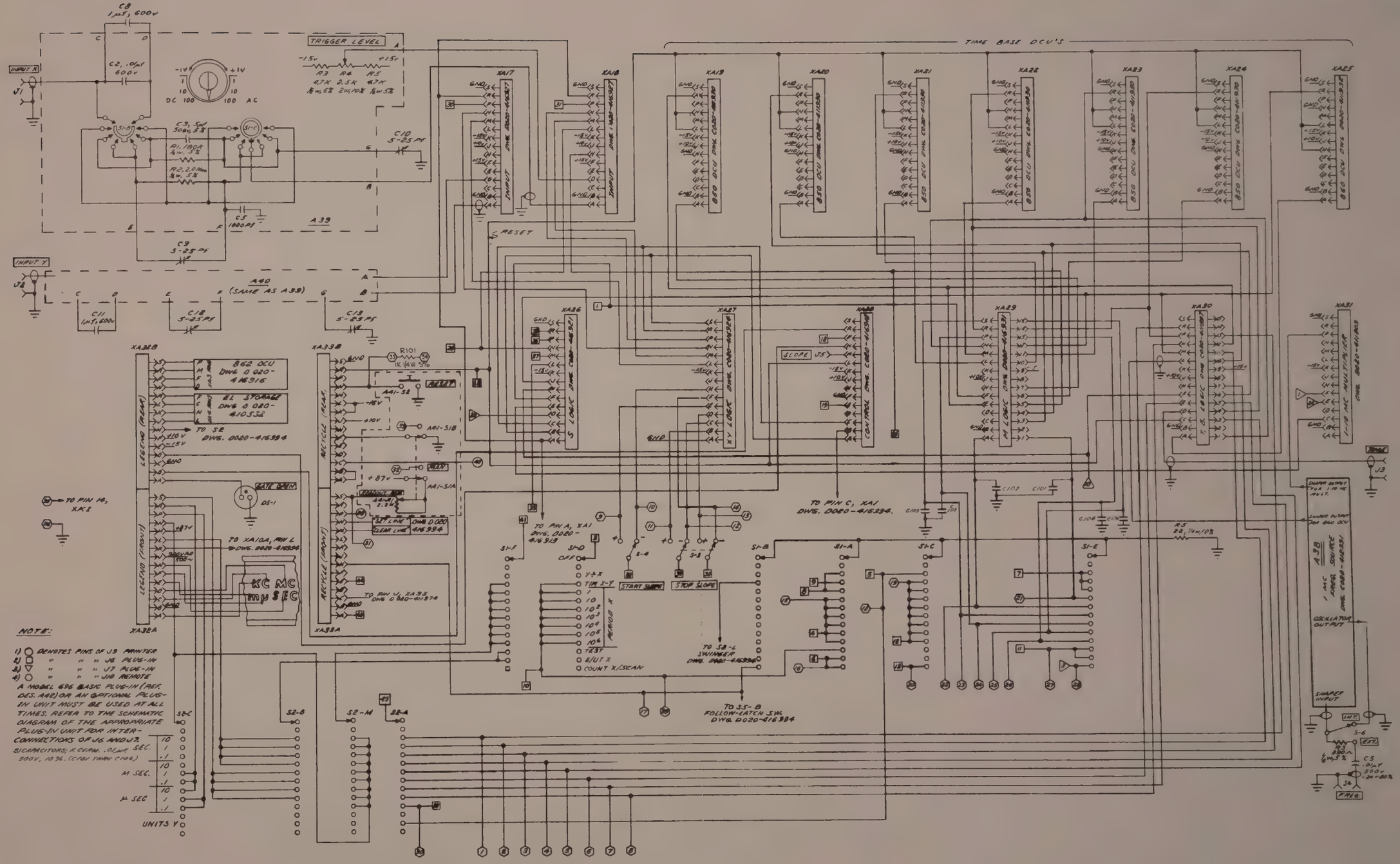


INPUT X
J1
C8 1µf, 600v
C2, .01µf 600V
TRIGGER LEVEL
-15 +15
R3 R4 R5
47K 2.5K 47K
¼w,5% 2w,10% ¼w 5%
-1V +1V
DC 100 100 AC
C3 .5pf 500v,5%
R1, 180K ½w, 5%
R2, 2.0Meg ½w, 5%
C10 5-25PF
C5 1000PF
A39
C9 5-25PF
INPUT Y
J2
A40 (SAME AS A39)
C11 1µf, 600v
C12 5-25PF
C13 5-25PF
R101 1K ¼W, 5%
TIME BASE DCU'S
XA17 AMPLIFIER DWG. C020-411935
XA18 AMPLIFIER DWG. C020-411935
XA19 850 DCU DWG. C020-411930
XA20 850 DCU DWG. C020-411930
XA21 850 DCU DWG. C020-411930
XA22 850 DCU DWG. C020-411930
XA23 850 DCU DWG. C020-411930
XA24 850 DCU DWG. C020-411930
XA25 860 DCU DWG. D020-411932
XA26 F LOGIC
XA27 B LOGIC
XA28 CONTROL DWG. C020-411820
XA29 M LOGIC DWG. C020-411487
XA30 T B LOGIC
XA31 1.10 MC MULTIPLIER DWG. B020-411809
XA32B
860 DCU DWG D 020-411498
EL STORAGE DWG D 020-411498
LEGEND (REAR)
LEGEND (FRONT)
XA32A
XA33B
RECYCLE (REAR)
RECYCLE (FRONT)
XA33A
A41-3A
A41-31B
A41-S1A
SET LINE
CLEAR LINE
DWG D 020-411498
DS-1
KC MC
mµ SEC
TO PIN J, XA35 DWG D-020-411874
TO PIN A, XA1 (STROBE) DWG D020-411498
J5
For Reset Line Only
To Pin 14 XK-1
651 Polarity Information
Form C Arm.
N.O. Contacts (+Polarity)
N.C. Contacts (-Polarity)
NOTE:
1) ○ DENOTES PINS OF J9 PRINTER
2) □ " " " J6 PLUG-IN
3) ▽ " " " J7 PLUG-IN
4) ⬡ " " " J10
A MODEL 696 BASIC PLUG-IN (REF. DES. A42) OR AN OPTIONAL PLUG-IN UNIT MUST BE USED AT ALL TIMES. REFER TO THE SCHEMATIC DIAGRAM OF THE APPROPRIATE PLUG-IN UNIT FOR INTERCONNECTIONS OF J6 AND J7.
SEC.
M SEC.
µ SEC
UNITS Y
S2-B
S2-M
S2-A
S1-D
OFF
Y÷X
TIM X-Y
PERIOD X
TEST
E/UT X
COUNT X/SCAN
S-4
START SLOPE
STOP SLOPE
S1-B
S1-A
S1-C
S1-E
TO S2-L SWINGER DWG. D020-411498
TO S5-B FOLLOW-LATCH SW. DWG D020-411498
C105
C103
C102
C101
C104
C106
R5 22 ¼w 10%
A98
FREQ SOURCE DWG C020-412391
OSCILLATOR OUTPUT
SHAPER INPUT
TIME
J3
INT.
EXT.
S-6
R3 390Ω ¼W, 5%
C5
J4
FREQ

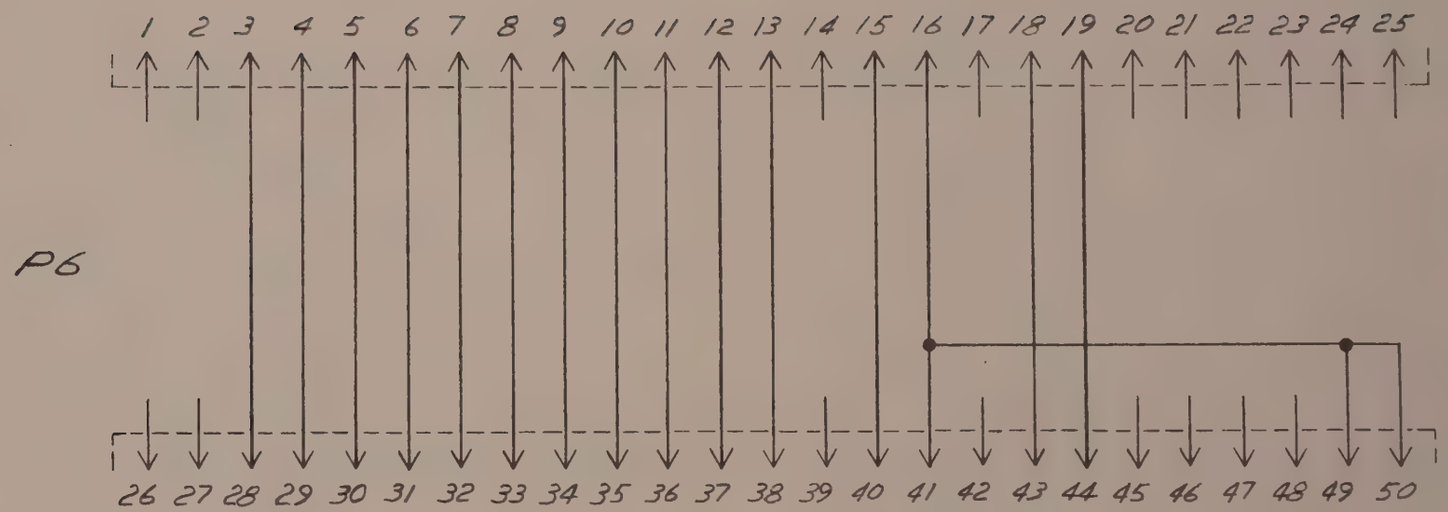
6146/26; 6144/24
D421974-Rev. A
January 1965

Beckman

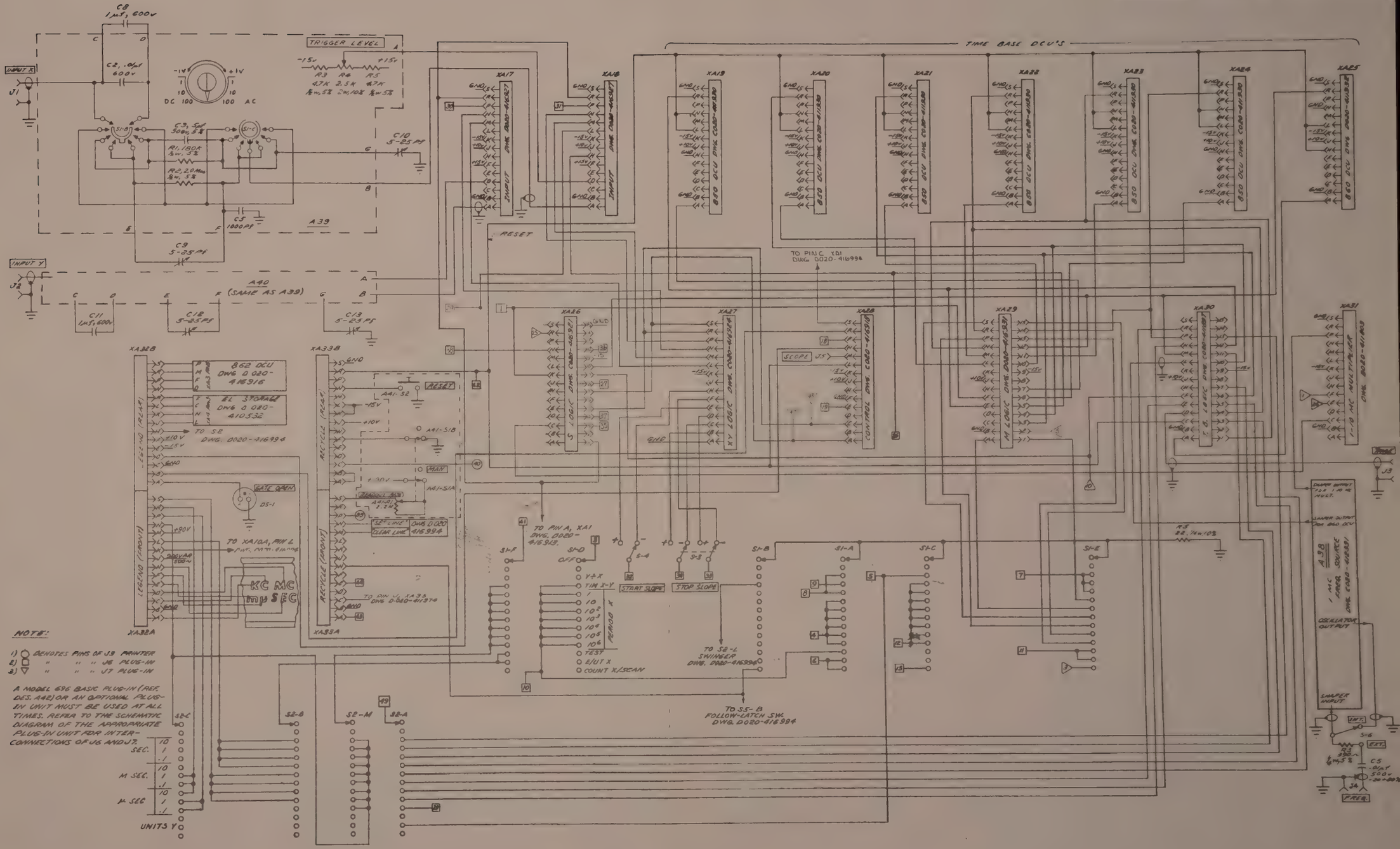
MOD. AD - MODELS 6127 & 6147
UNIT LOGIC - REMOTE
SCHEMATIC DIAGRAM 6



Beckman®

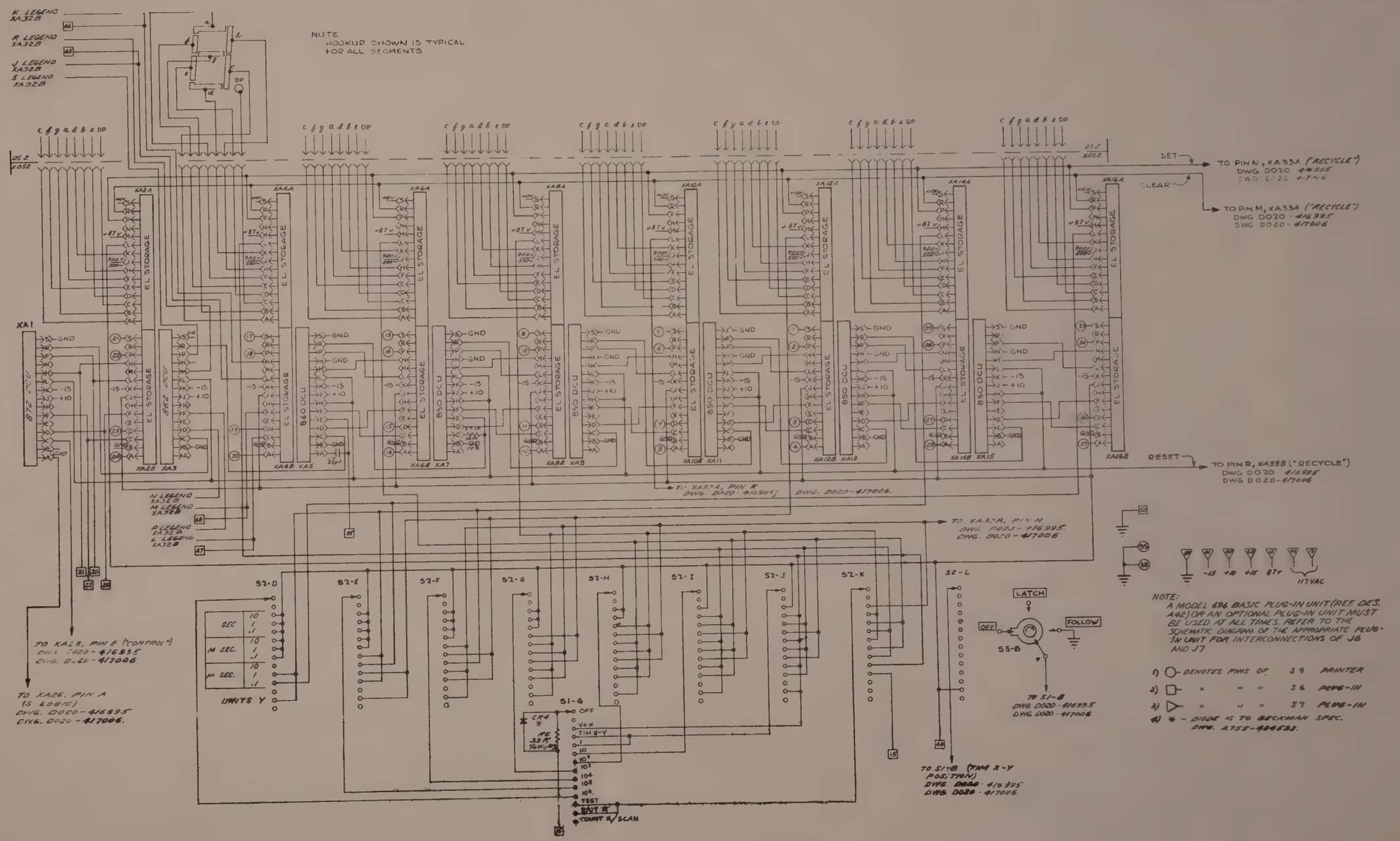

P6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

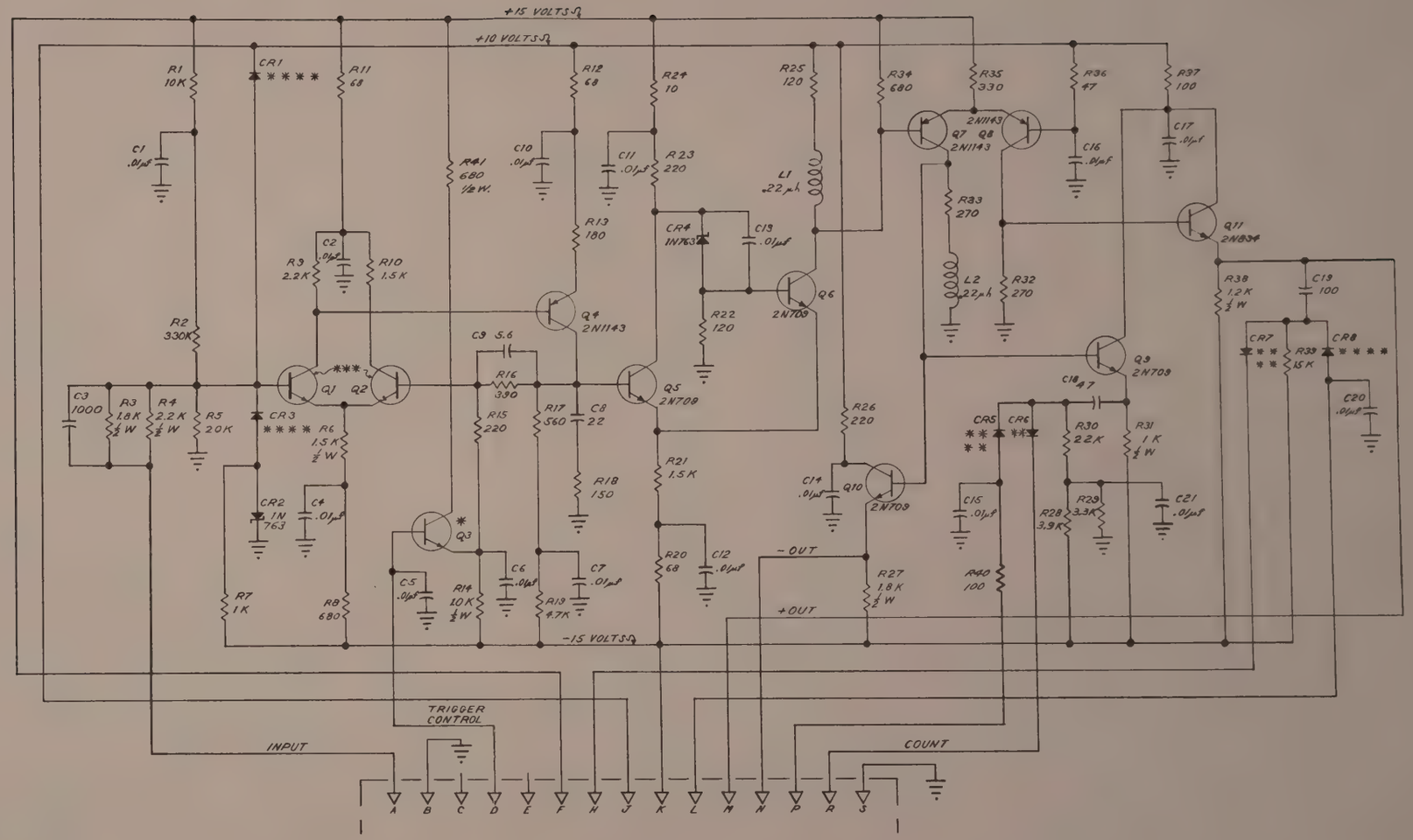
MODEL 6147
UNIT LOGIC
SCHEMATIC DIAGRAM 8


TIME BASE DCU'S
TRIGGER LEVEL
INPUT X
INPUT Y
A39
A40 (SAME AS A39)
RESET
TO PIN C YDI DWG. D020-416994
SCOPE
TO S2 DWG. D020-416994
TO PIN A, XA1 DWG. D020-416913
TO S2-L SWINGER DWG. D020-416994
TO S5-B FOLLOW-CATCH SW. DWG. D020-416984
TO PIN "L" XA33 DWG. D020-411374
TO XA10A, PIN L
GATE OPEN
START SLOPE
STOP SLOPE
PERIOD X
UNITS Y
KC MC
mμ SEC
NOTE:
1) ○ DENOTES PINS OF J8 PRINTER
2) □ " " " J6 PLUG-IN
3) ▽ " " " J7 PLUG-IN
A MODEL 696 BASIC PLUG-IN (REF. DES. A42) OR AN OPTIONAL PLUG-IN UNIT MUST BE USED AT ALL TIMES. REFER TO THE SCHEMATIC DIAGRAM OF THE APPROPRIATE PLUG-IN UNIT FOR INTER-CONNECTIONS OF J6 AND J7.

Beckman

MODELS 6127 & 6147
COUNT LOGIC
SCHEMATIC DIAGRAM 7

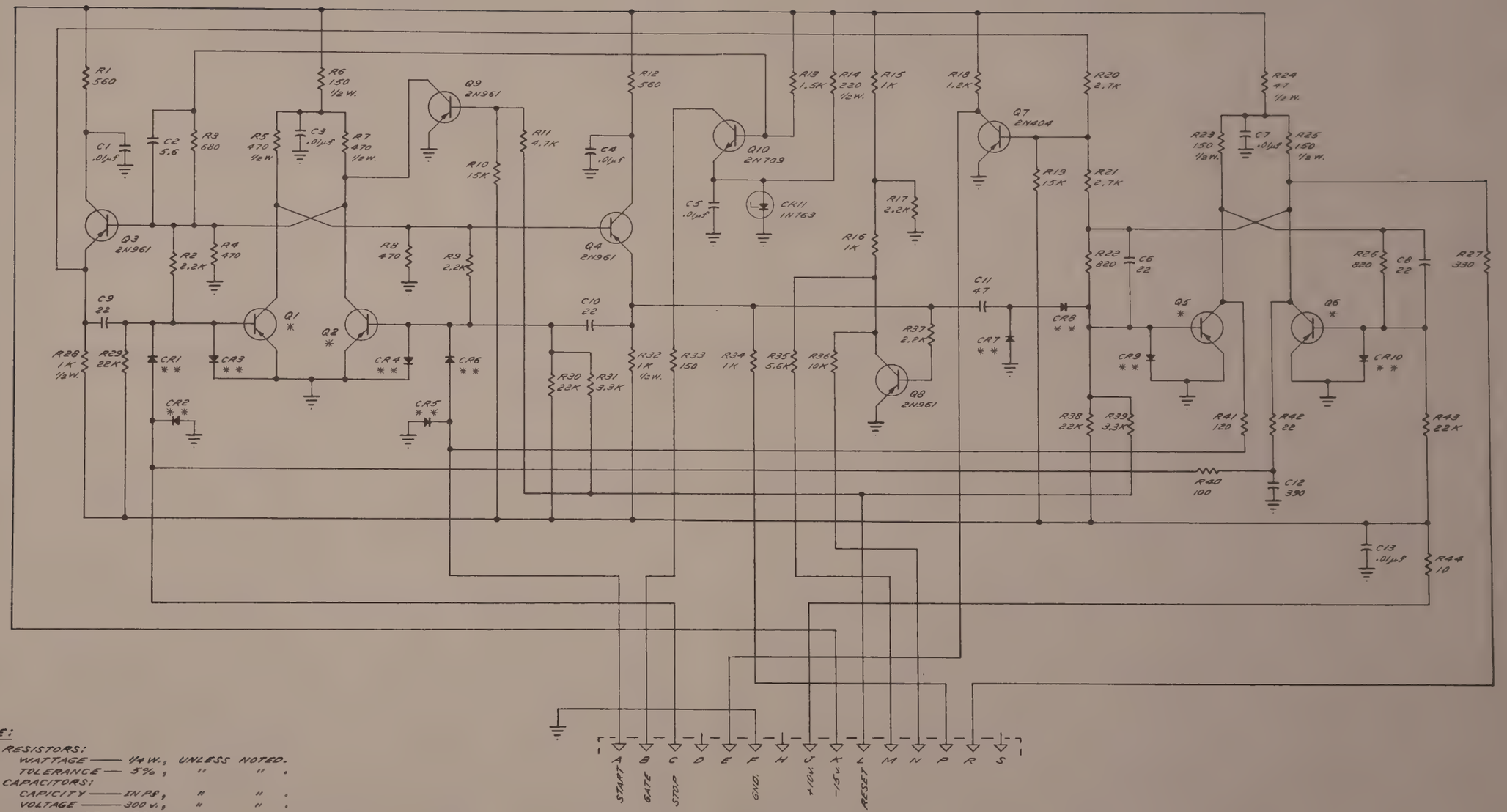




NOTE:

1) RESISTORS:
   WATTAGE ——— 1/4 W., UNLESS NOTED.
   TOLERANCE —— 5% , " " .
2) CAPACITORS:
   CAPACITY ——— IN pf , " " .
   VOLTAGE ——— 300 v., " " .
   TOLERANCE —— 5 % , " " .
3) .01μf DISC ARE -20+80%, 50 v.
4) * — TRANSISTOR IS TO BECKMAN SPEC. DWG. A755-409895.
5) ** — DIODE IS TO BECKMAN SPEC. PART NO 755-817250.
6) *** — TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-417481.
7) **** — DIODES ARE TO BECKMAN SPEC. PART NO 755-815561.

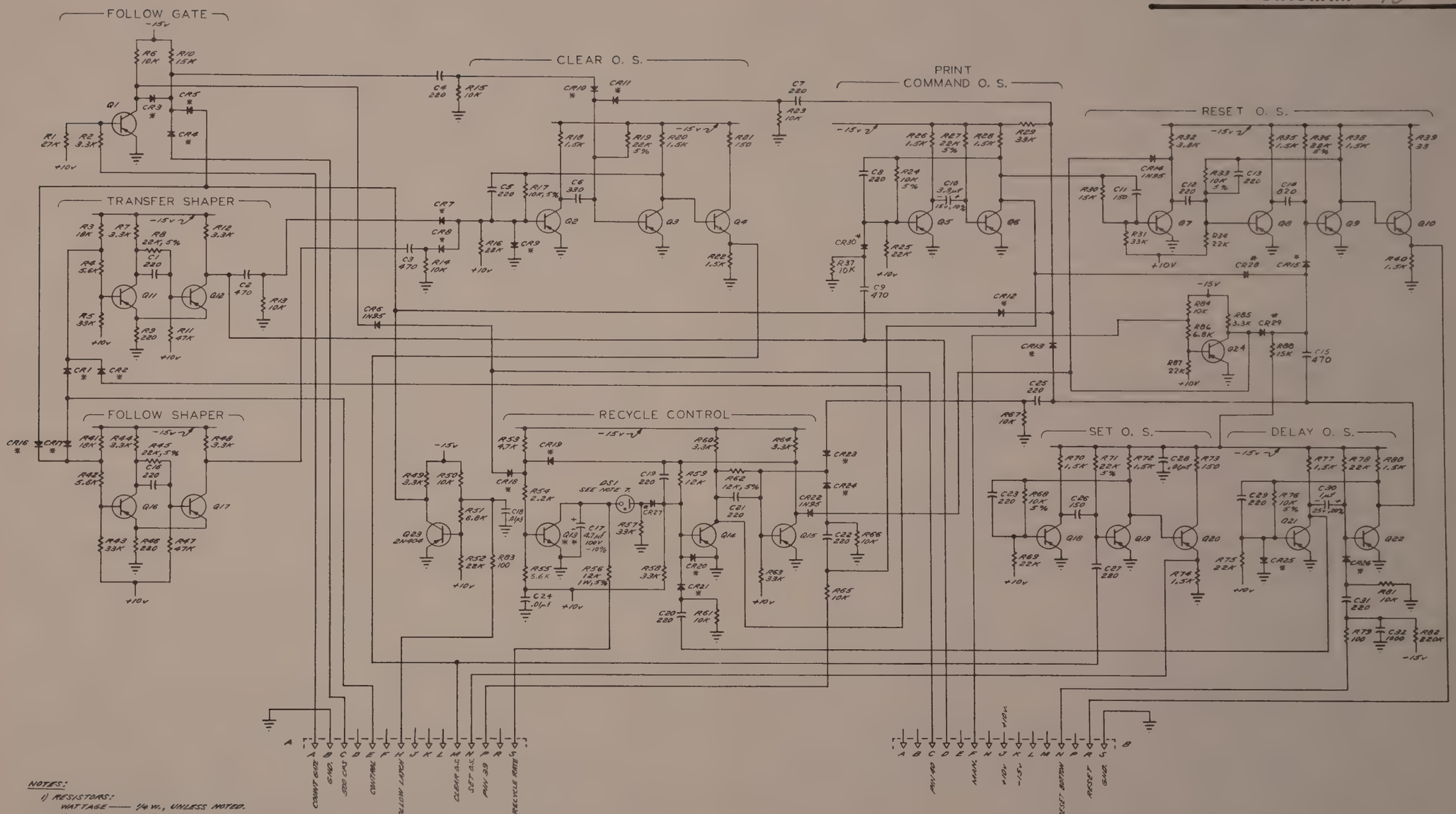
MODELS 6127 & 6147
CONTROL
SCHEMATIC DIAGRAM //



NOTE:

1) RESISTORS:
   WATTAGE —— 1/4 W., UNLESS NOTED.
   TOLERANCE — 5% , " " .
2) CAPACITORS:
   CAPICITY —— IN PF , " " .
   VOLTAGE —— 300 V. , " " .
   TOLERANCE — 5 % , " " .
3) .01µf DISC ARE -20+80%, 50V.
4) * — TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-415036.
5) ** -DIODES ARE TO BECKMAN (CR1 THRU CR10) PART № 755-817230.

MODEL 6100 SERIES
RECYCLE
SCHEMATIC DIAGRAM 12



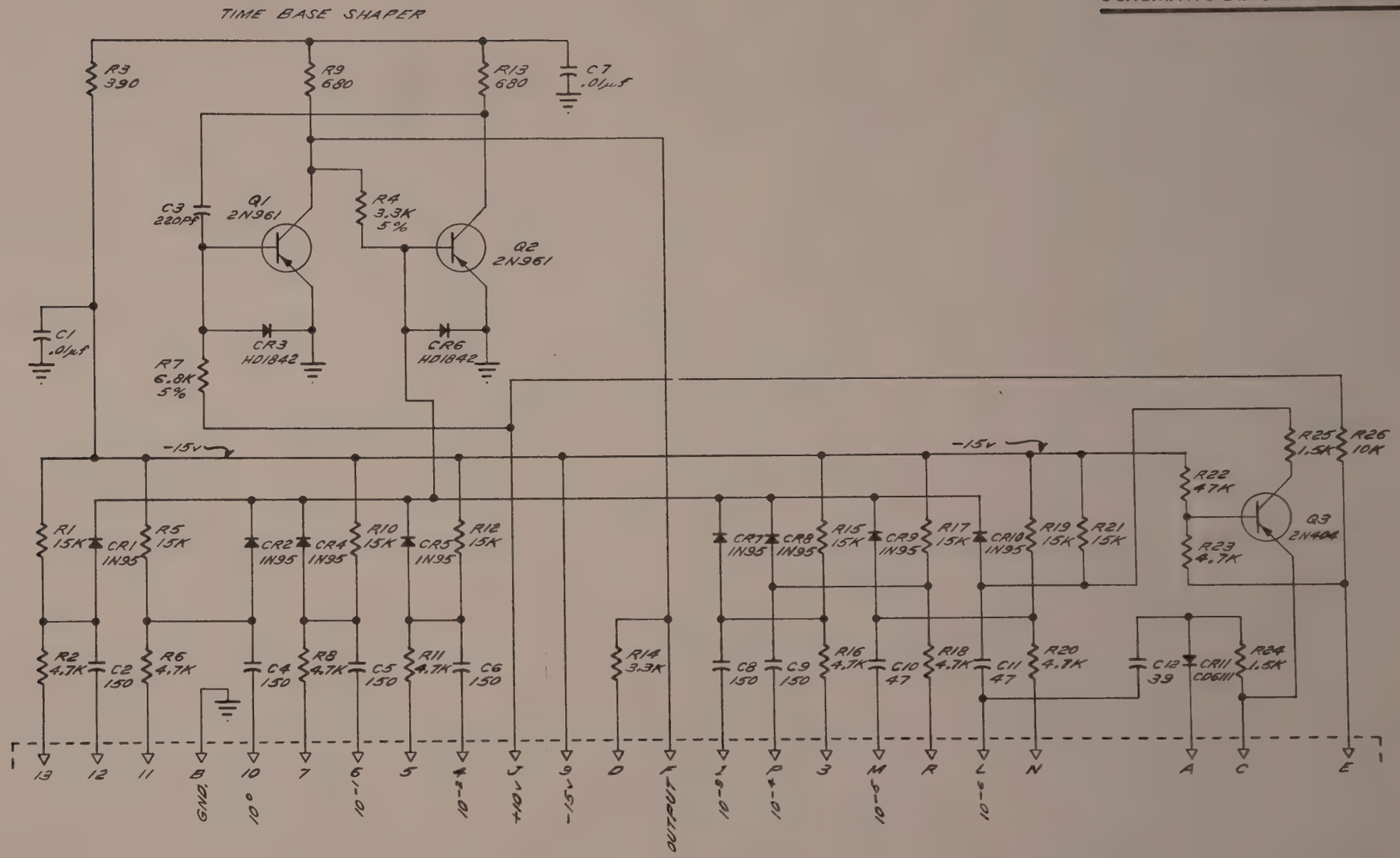
NOTES:

1) RESISTORS:
   WATTAGE — 1/4 W., UNLESS NOTED.
   TOLERANCE — 10 %, " " ,
2) CAPACITORS:
   CAPACITY — IN PF, " " ,
   VOLTAGE — 300 V, " " ,
   TOLERANCE — 5 %, " " .
3) .01 μf DISC ARE -20 + 80 %, 500 v.
4) * - DIODES ARE TO BECKMAN SPEC. DWG. A755-404593.
5) ** - TRANSISTOR TO BECKMAN SPEC. DWG. A735-410066.
6) ALL TRANSISTORS ARE 2N404, UNLESS NOTED.
7) DS1 - IS TO BECKMAN SPEC. DWG. A825-404955.

MODELS:
6124, 6144, 6126
6146, 6127, 6147
D411909-Rev. E
February 1964

Beckman

Lot 5+



NOTE:

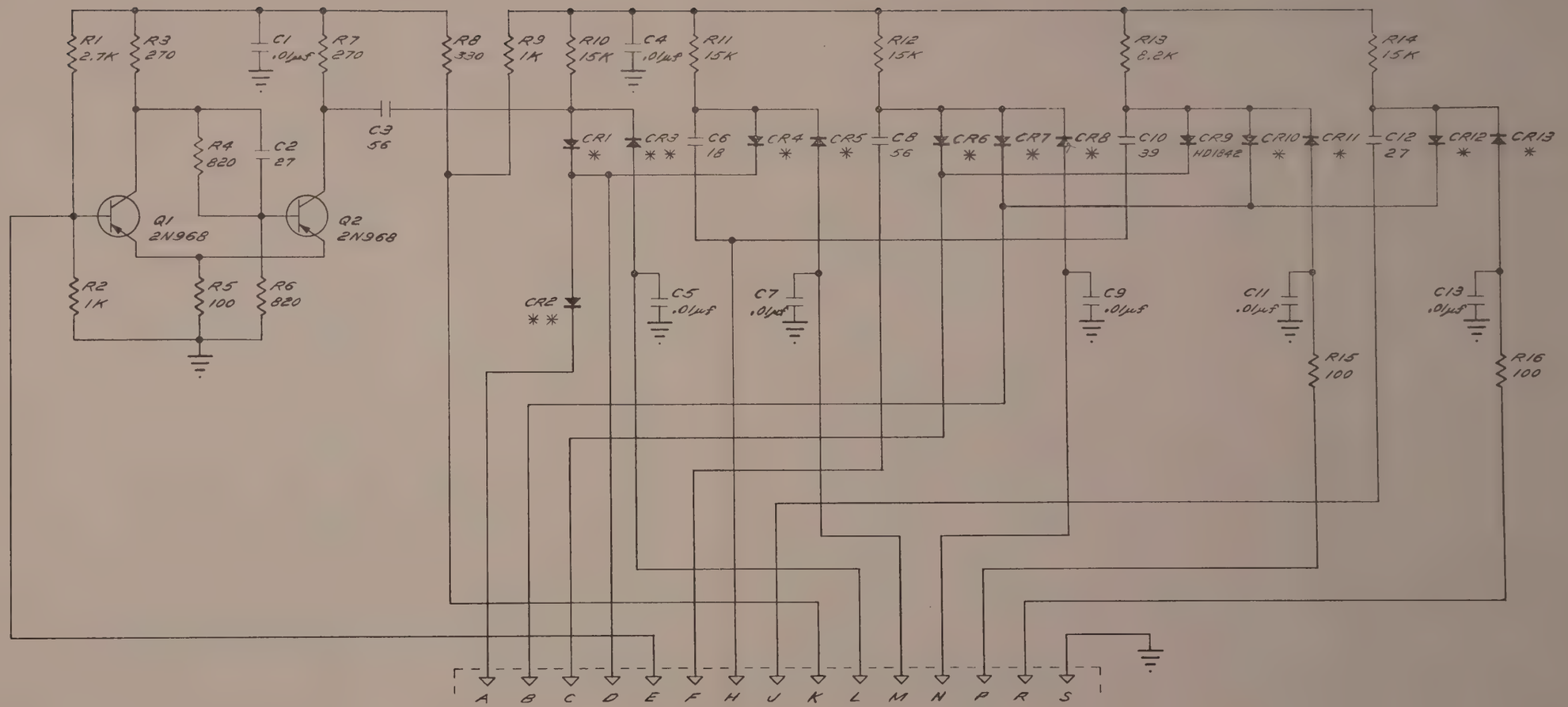
1) RESISTORS:
   - WATTAGE —— 1/4W, UNLESS NOTED.
   - TOLERANCE —— 10%, " " .
2) CAPACITORS:
   - CAPACITY —— IN Pf, " " .
   - VOLTAGE —— 300v, " " .
   - TOLERANCE —— 5%, " " .
3) .01µf DISC ARE -20+80%, 500v.

MODELS:
6124, 6144, 6126,
6146, 6127, 6147
C 411897 - Rev. C
November 1963

Beckman

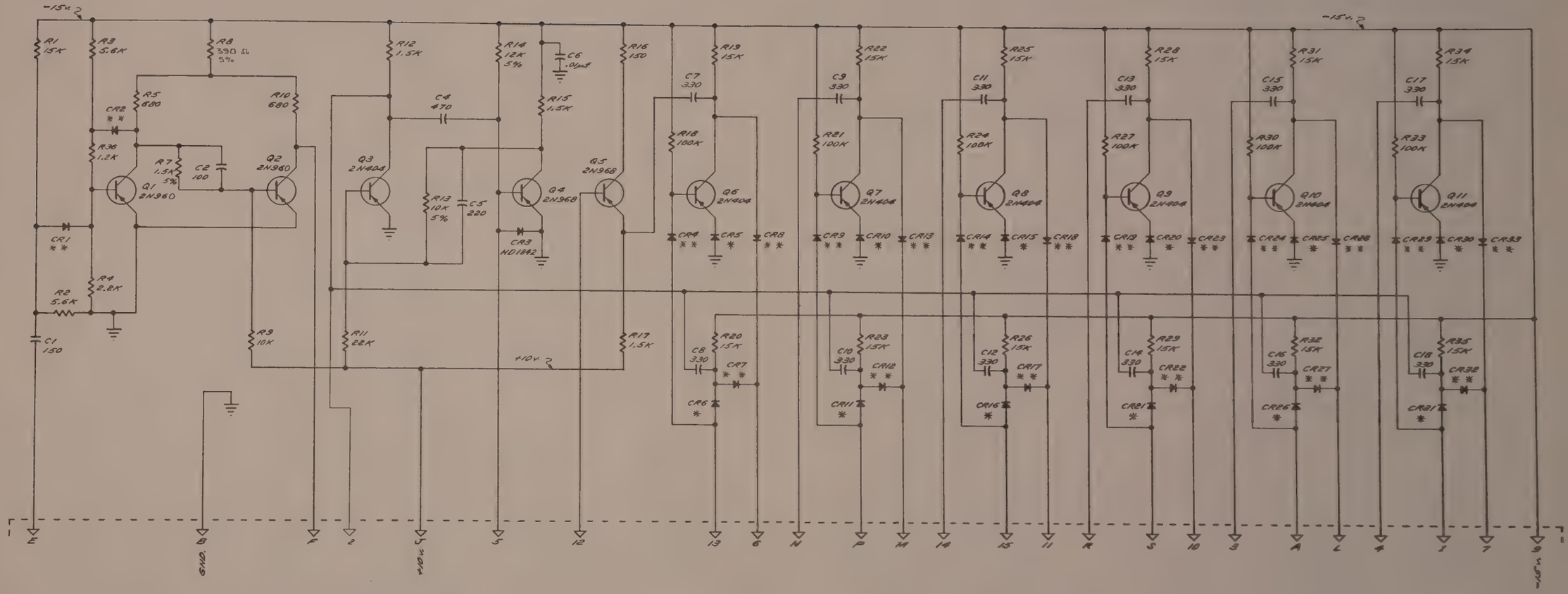
P. C. Board Lot 2+

MODELS 6127 & 6147
"S" LOGIC
SCHEMATIC DIAGRAM 14



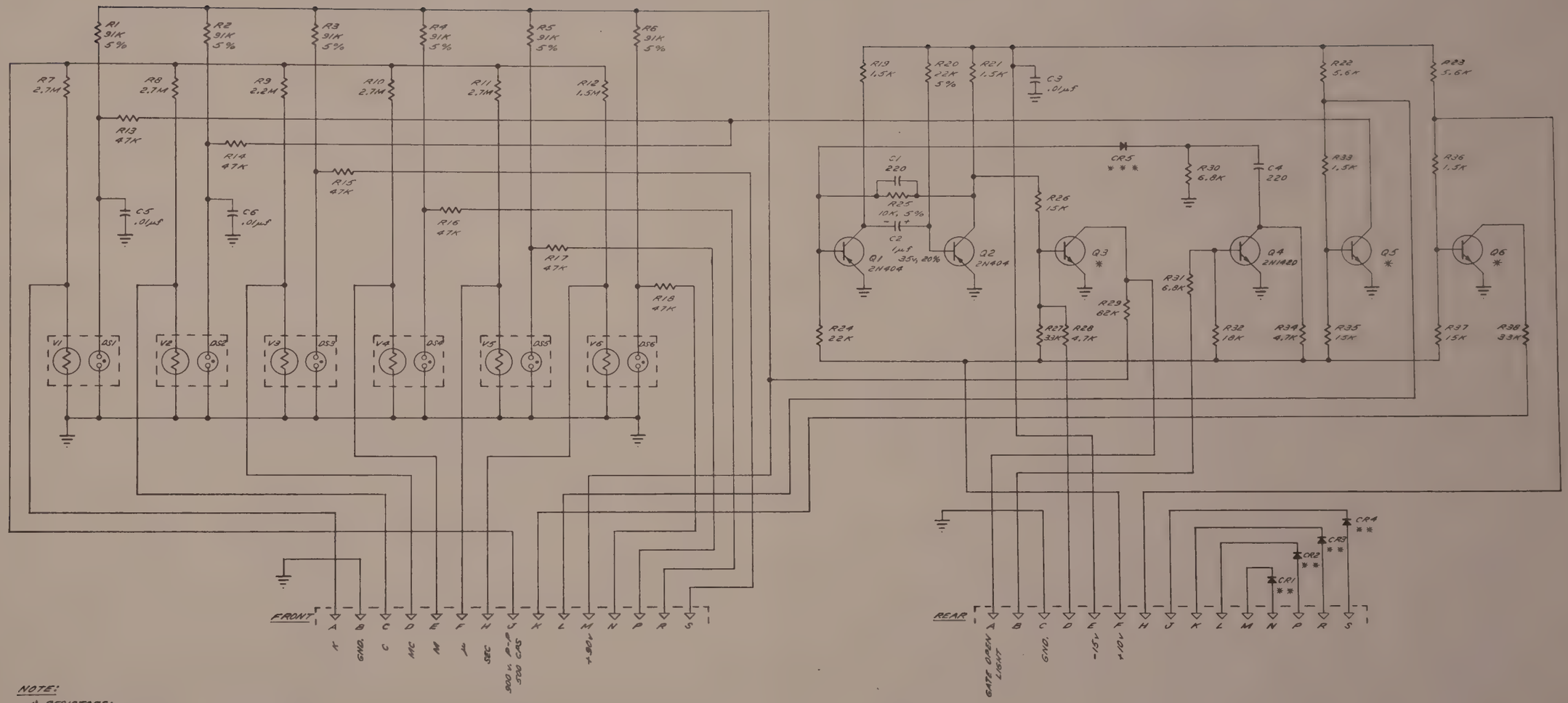
NOTE:

1) RESISTORS:
   WATTAGE —— 1/4 W., UNLESS NOTED.
   TOLERANCE — 5 % , " " .
2) CAPACITORS:
   CAPACITY —— IN PF , " " .
   VOLTAGE —— 300 v. , " " .
   TOLERANCE — 5 % , " " .
3) .01µf DISC ARE -20+80 %, 50 v.
4) * — DIODES ARE TO BECKMAN SPEC. PART Nº 755-815561.
5) ** — DIODES ARE TO BECKMAN SPEC. PART Nº 755-828597.



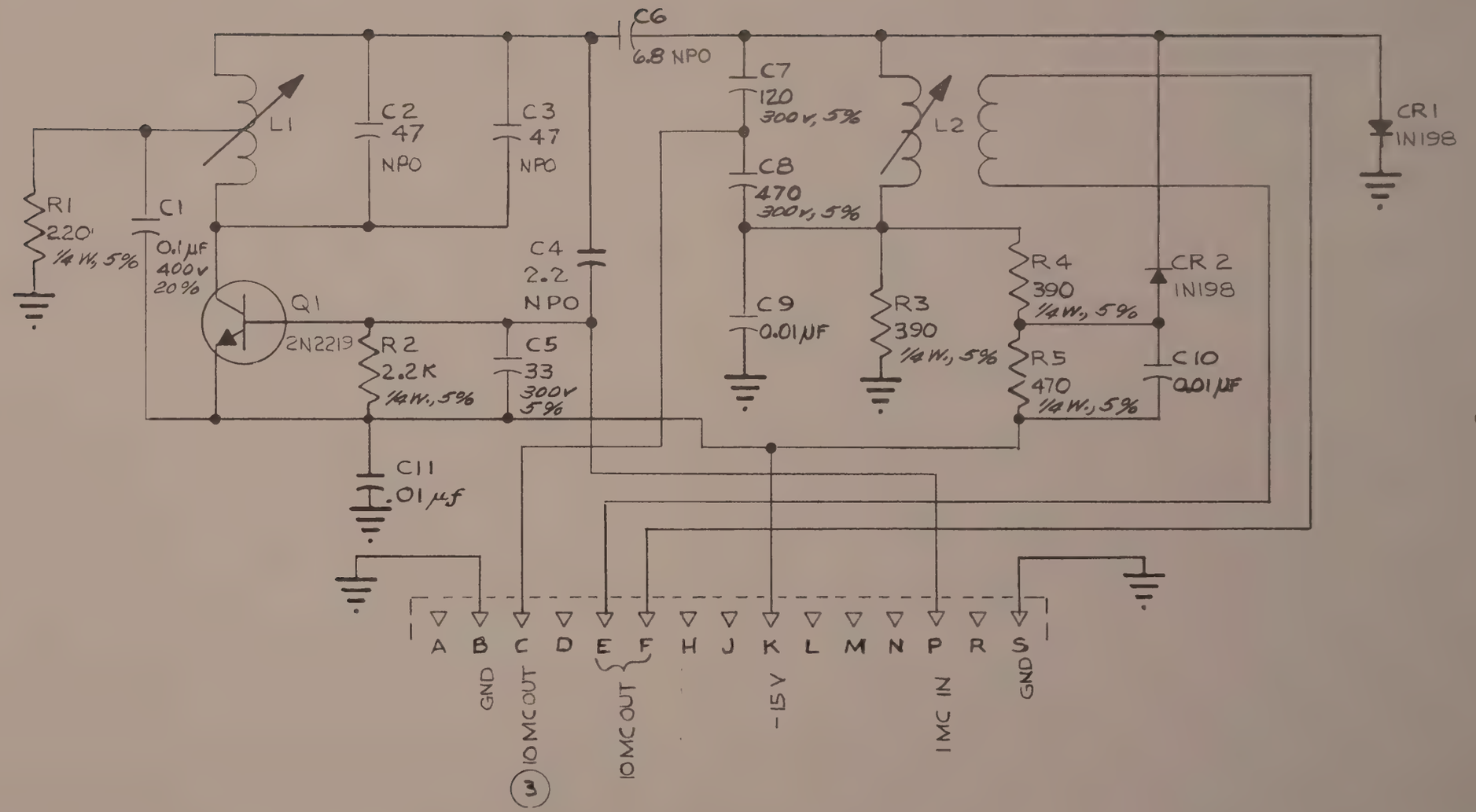
NOTE:

1) RESISTORS:
   WATTAGE —— ½ W, UNLESS NOTED.
   TOLERANCE — 10%, " " .
2) CAPACITORS:
   CAPACITY —— IN μf, " " .
   VOLTAGE —— 300 v., " " .
   TOLERANCE — 5%, " " .
3) .01μf DISC ARE −20+80%, 50v.
4) * — DIODES ARE TO BECKMAN SPEC. DWG. A755-402323.
5) ** — DIODES ARE TO BECKMAN SPEC. DWG. A755-402107.



NOTE:

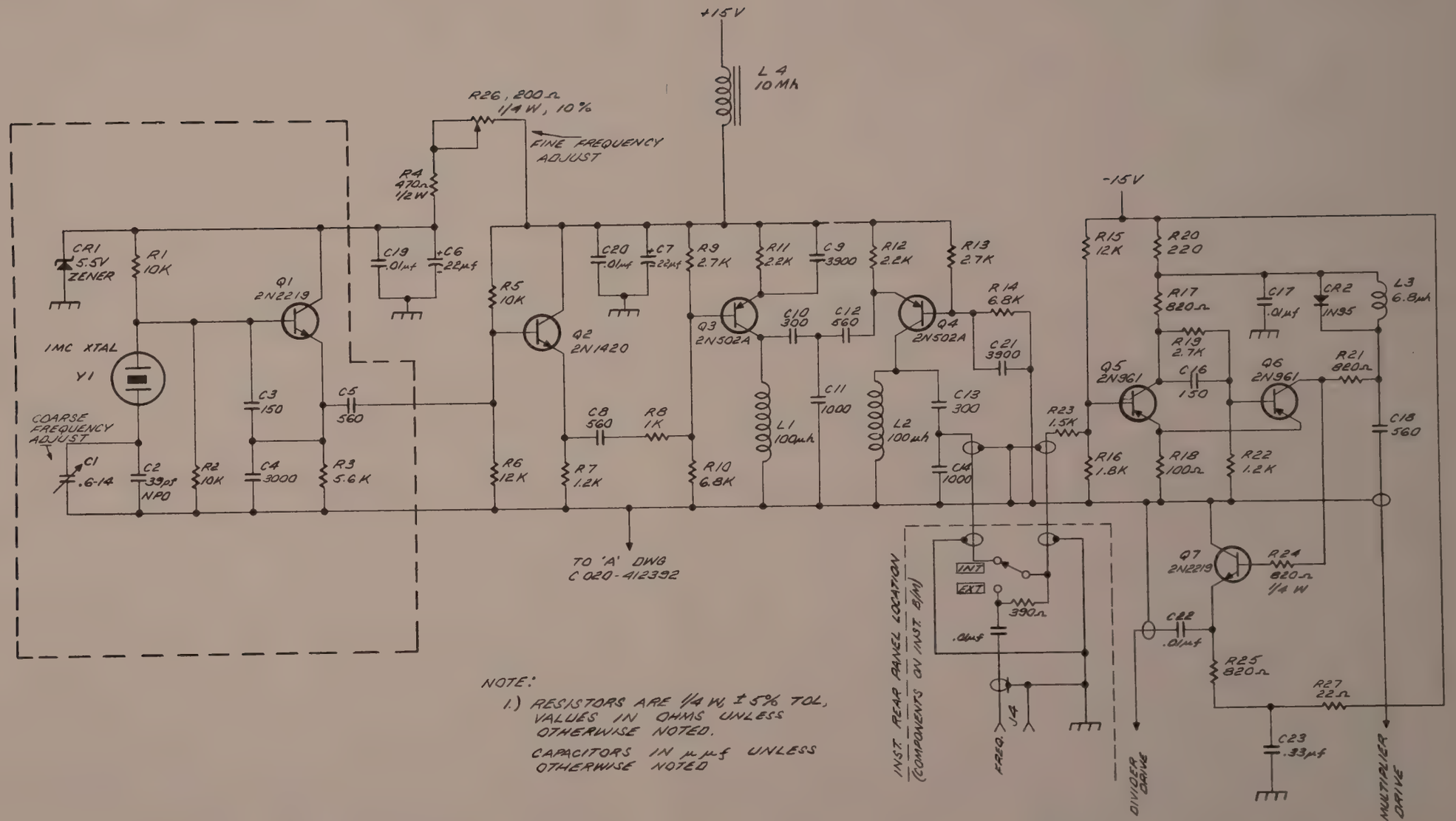
1) RESISTORS:
   WATTAGE —— 1/4 W., UNLESS NOTED.
   TOLERANCE —— 10 % , " " .
2) CAPACITORS:
   CAPACITY —— IN PF., " " .
   VOLTAGE —— 300 v. , " " .
   TOLERANCE —— 5% , " " .
3) .01μf DISC ARE -20+80%, 500 v.
4) ALL NEON BULBS ARE TO BECKMAN SPEC. DWG. A825-414955. (OS1 THRU OS6)
6) ALL PHOTORESISTORS ARE TO BECKMAN SPEC. DWG. A753-416278. (V1 THRU V6)
7) * — TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-410066.
8) * * — DIODES ARE TO BECKMAN SPEC. PART Nº 755-815561. (CD611)
9) * * * — DIODE TO BECKMAN SPEC. DWG. Nº A755-404593.



NOTE:

1) CAPACITORS:
   CAPACITY —— IN Pf, UNLESS NOTED.
   VOLTAGE —— 600v, " " ,
   TOLERANCE — 10 %, " " .
2) 0.01µf DISC ARE -20+80%, 500v.
(3) TO DRIVE COUNT GATE CIRCUITRY.

MODEL 6100 SERIES
1 MC PRECISION OSCILLATOR
SCHEMATIC DIAGRAM 19

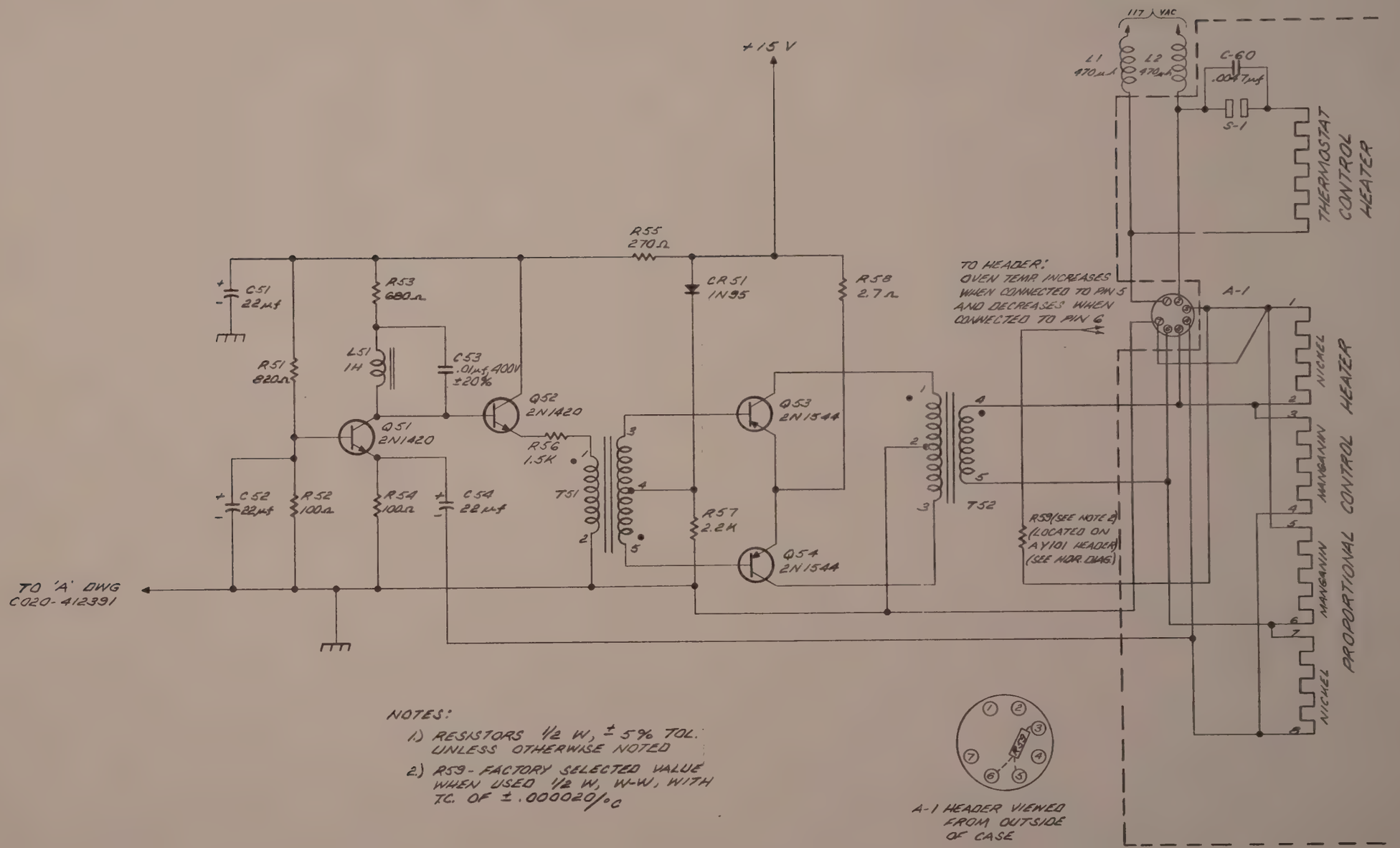


NOTE:

1.) RESISTORS ARE 1/4 W, ± 5% TOL, VALUES IN OHMS UNLESS OTHERWISE NOTED.

CAPACITORS IN μμf UNLESS OTHERWISE NOTED

MODEL 6100 SERIES
1 MC PRECISION OSCILLATOR
OVEN CONTROL
SCHEMATIC DIAGRAM 20

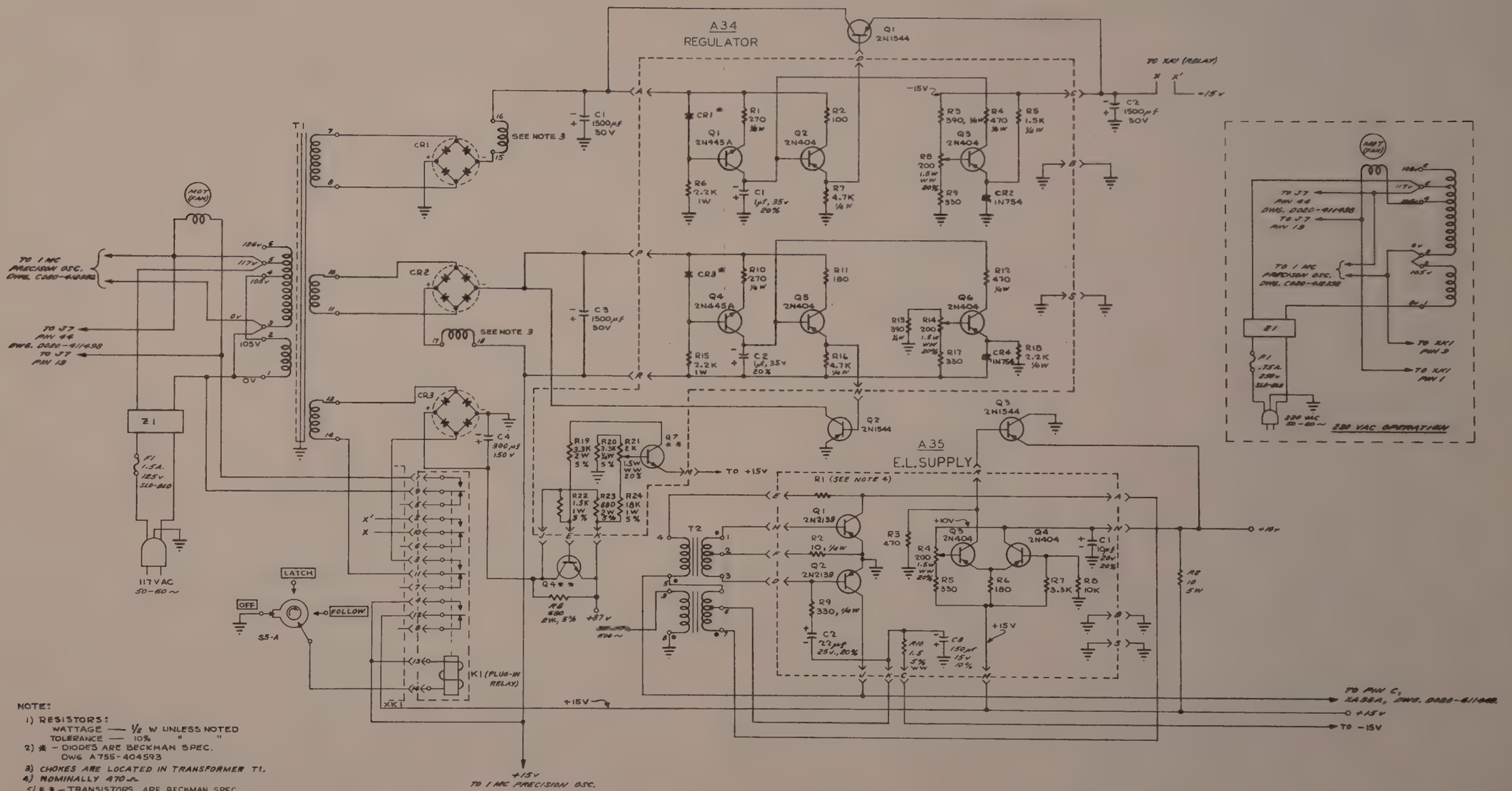


NOTES:

1) RESISTORS 1/2 W, ± 5% TOL. UNLESS OTHERWISE NOTED
2) R59 - FACTORY SELECTED VALUE WHEN USED 1/2 W, W-W, WITH T.C. OF ± .000020/°C

A-1 HEADER VIEWED FROM OUTSIDE OF CASE

MODEL 6100 SERIES
POWER SUPPLY
SCHEMATIC DIAGRAM 21

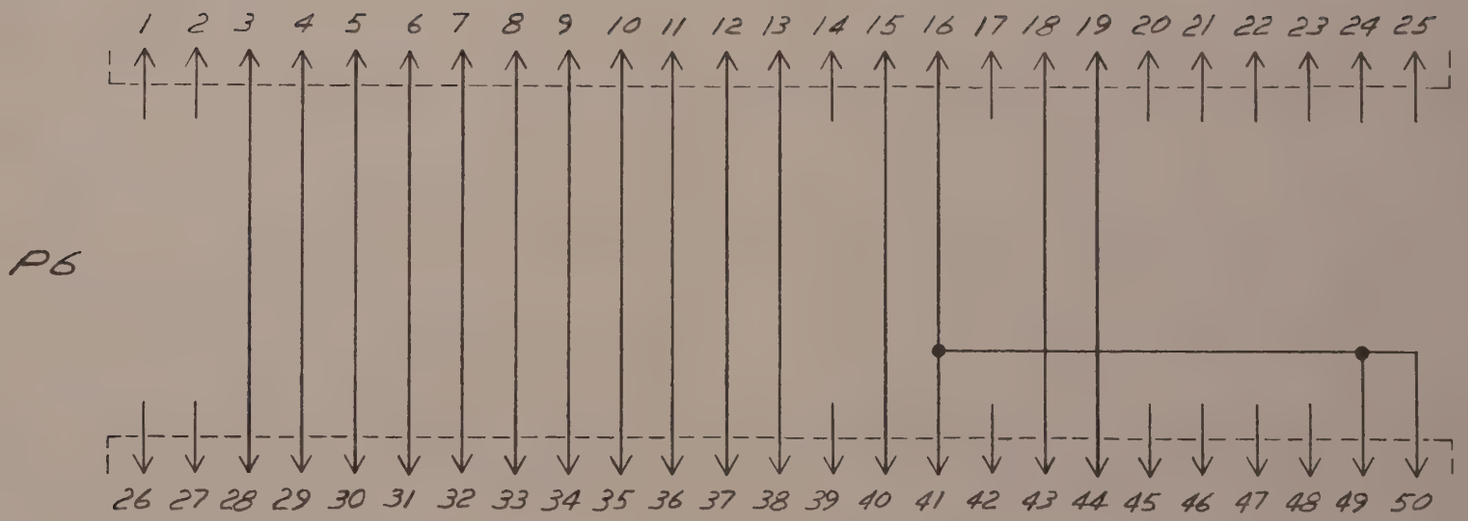


NOTE:
1) RESISTORS:
WATTAGE — 1/8 W UNLESS NOTED
TOLERANCE — 10% " "
2) * — DIODES ARE BECKMAN SPEC. DWG A755-404593
3) CHOKES ARE LOCATED IN TRANSFORMER T1.
4) NOMINALLY 470Ω.
5) * * — TRANSISTORS ARE BECKMAN SPEC. DWG A755-415078

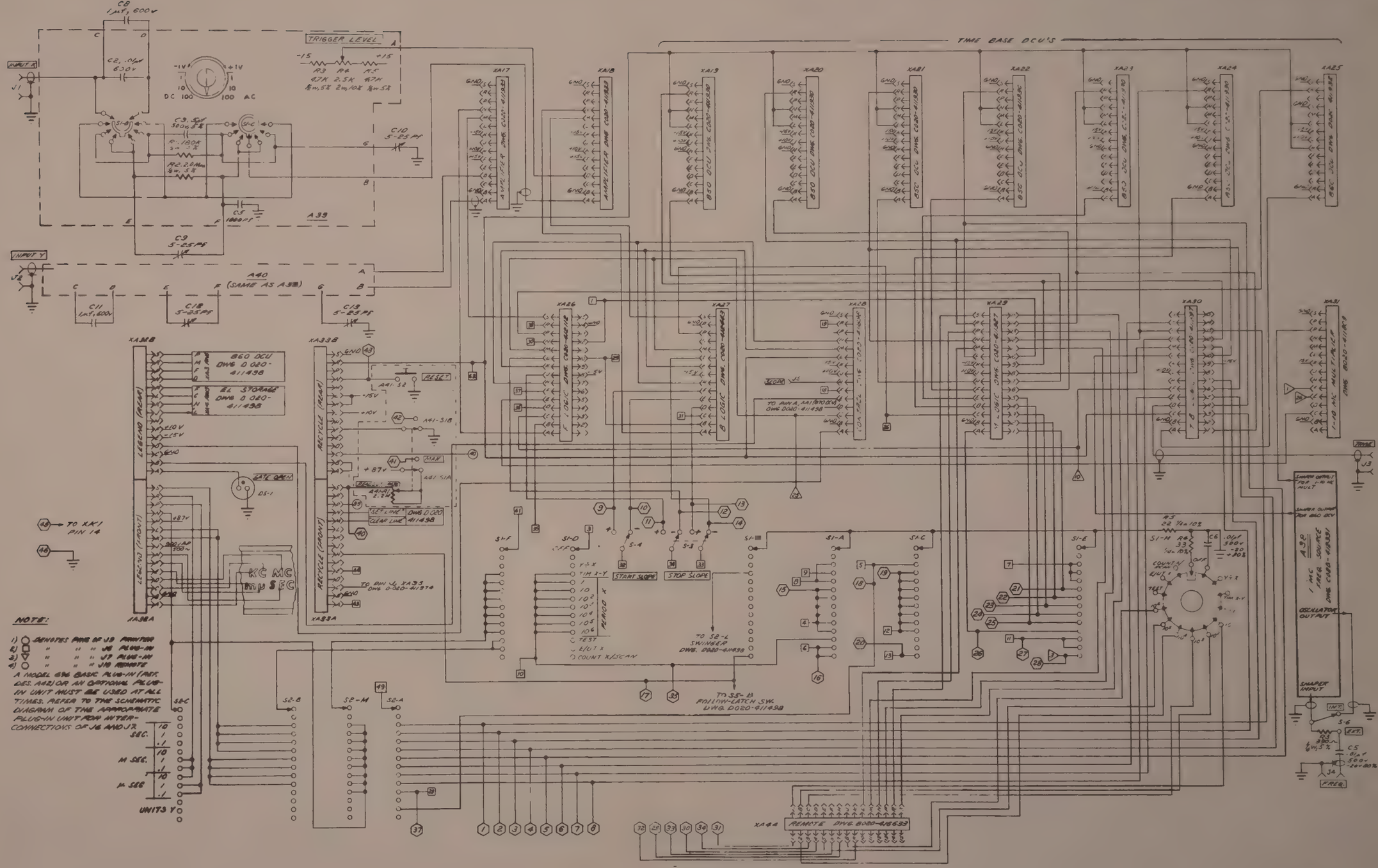
MODELS
6124, 6144, 6126
6146, 6127, 6147
D411974-Rev. I
February 1964

Beckman®

Serial 200+

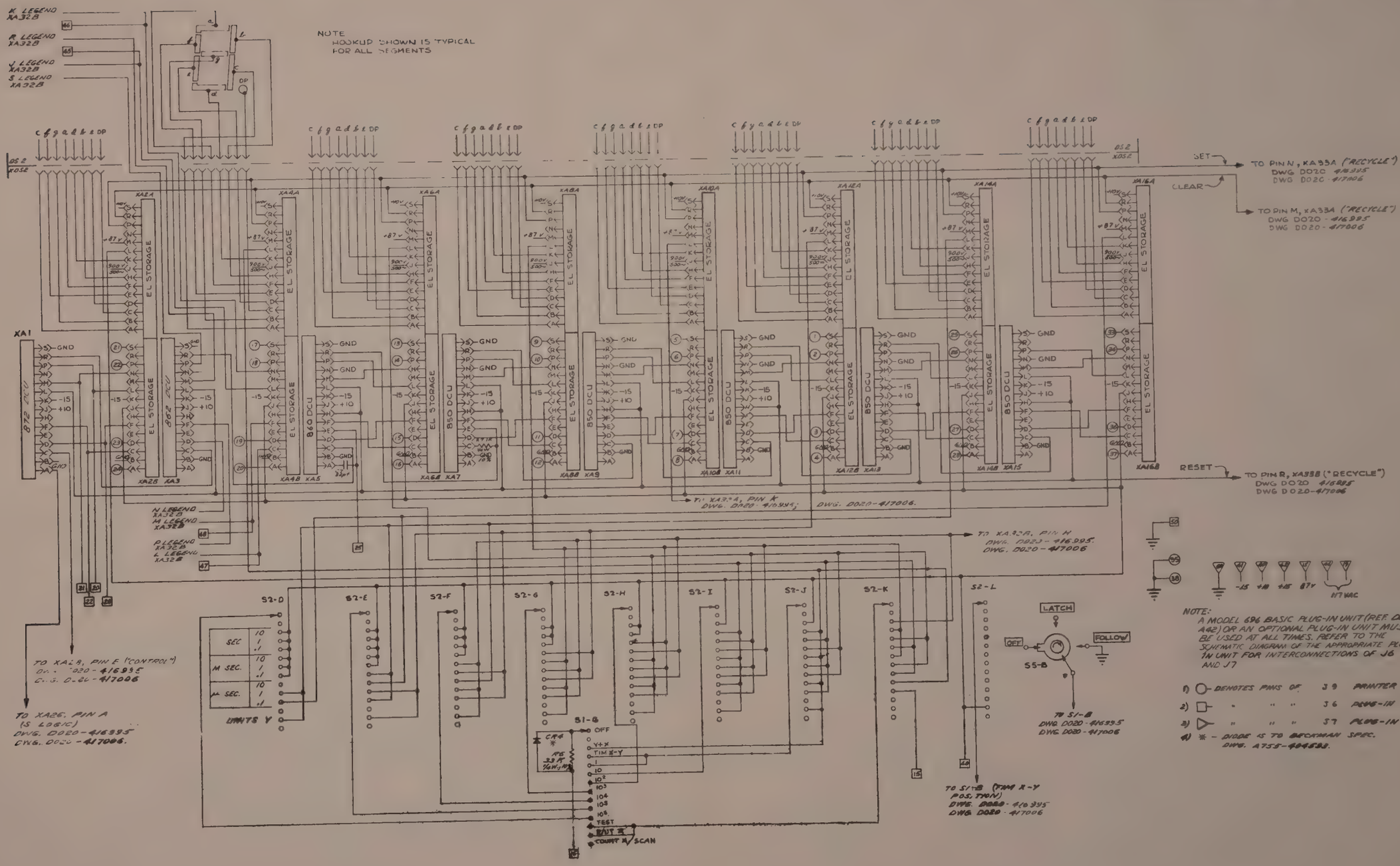

P6
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

MOD. AD - 6100 SERIES
UNIT LOGIC - REMOTE
SCHEMATIC DIAGRAM

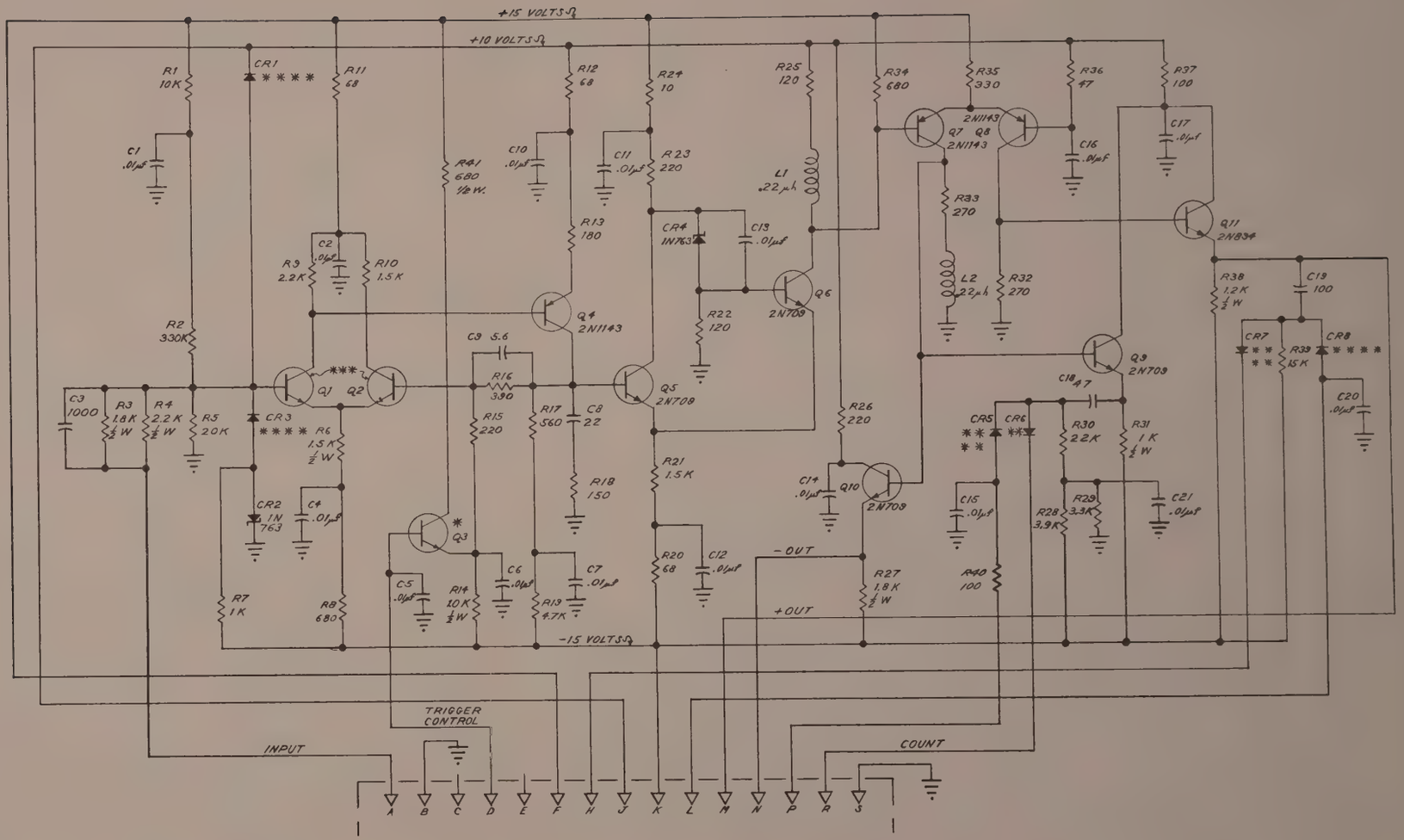


Beckman

MODELS 6127 & 6147
COUNT LOGIC
SCHEMATIC DIAGRAM



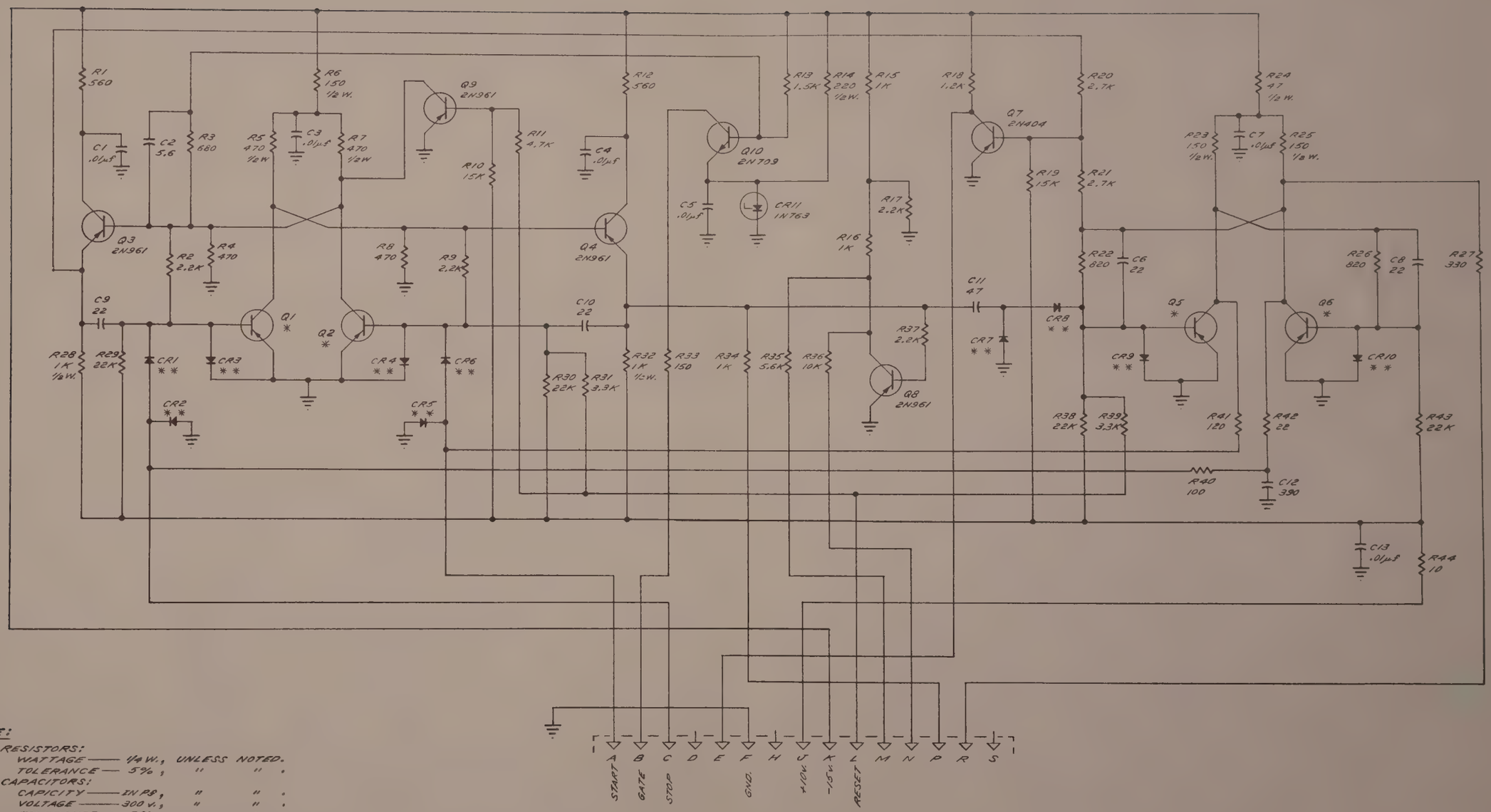
MODELS 6127 & 6147
50 MC AMPLIFIER
SCHEMATIC DIAGRAM



NOTE:

1) RESISTORS:
   WATTAGE —— 1/8 W., UNLESS NOTED.
   TOLERANCE —— 5% , " " .
2) CAPACITORS:
   CAPACITY —— IN μf , " " .
   VOLTAGE —— 300 v. , " " .
   TOLERANCE —— 5% , " " .
3) .01μf DISC ARE -20+80%, 50 V.
4) * — TRANSISTOR IS TO BECKMAN SPEC. DWG. A755-409895.
5) * * — DIODE IS TO BECKMAN SPEC. PART NO. 755-817250.
6) * * * — TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-417481.
7) * * * * — DIODES ARE TO BECKMAN SPEC. PART NO. 755-815561.

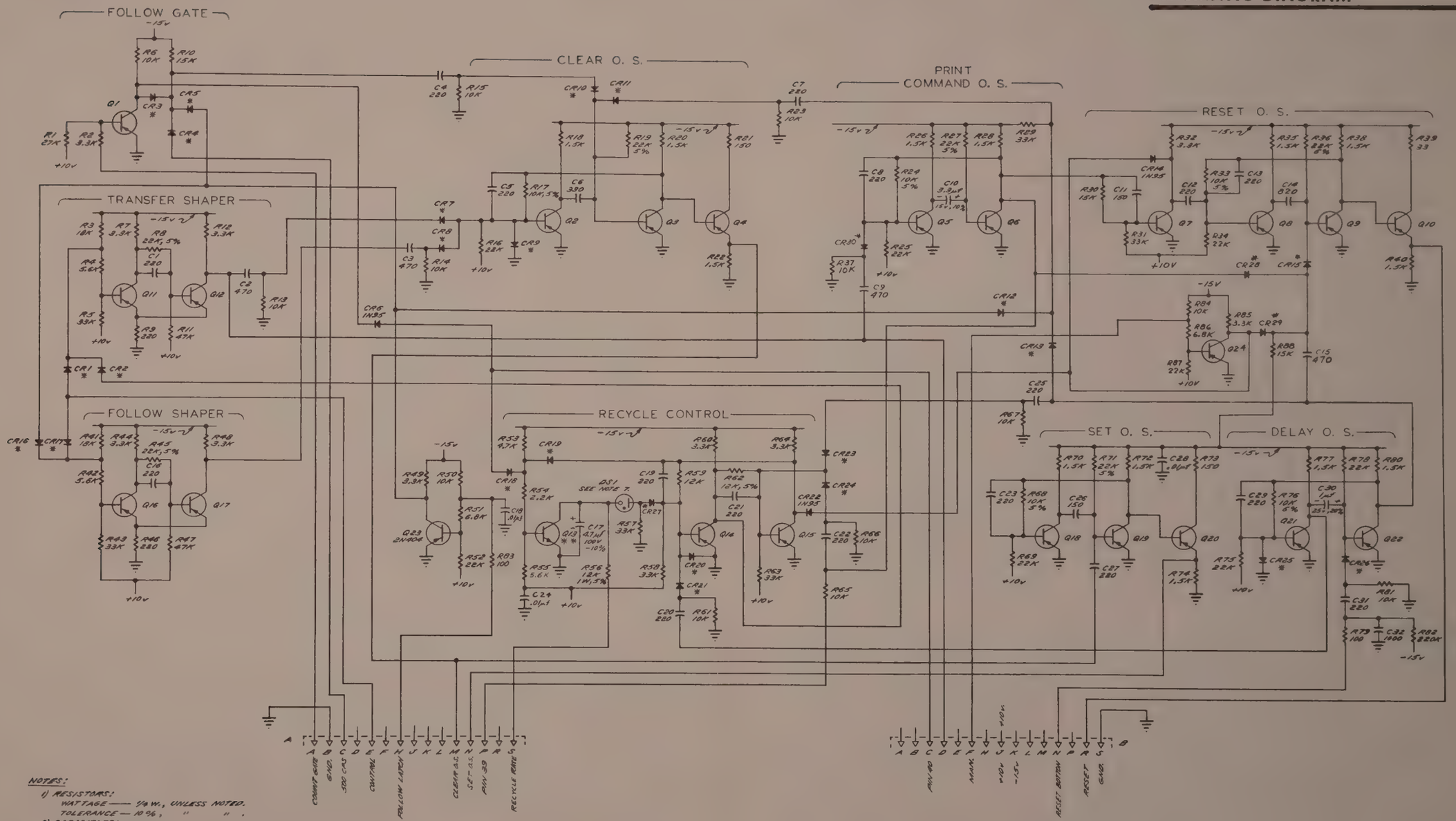
MODELS 6127 & 6147
CONTROL
SCHEMATIC DIAGRAM



NOTE:

1) RESISTORS:
   WATTAGE —— 1/4 W., UNLESS NOTED.
   TOLERANCE —— 5% , " " .
2) CAPACITORS:
   CAPACITY —— IN PF , " " .
   VOLTAGE —— 300 V., " " .
   TOLERANCE —— 5% , " " .
3) .01μf DISC ARE -20+80%, 50V.
4) * - TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-415036.
5) ** - DIODES ARE TO BECKMAN (CR1 THRU CR10) PART № 755-817250.

MODEL 6100 SERIES
RECYCLE
SCHEMATIC DIAGRAM



NOTES:

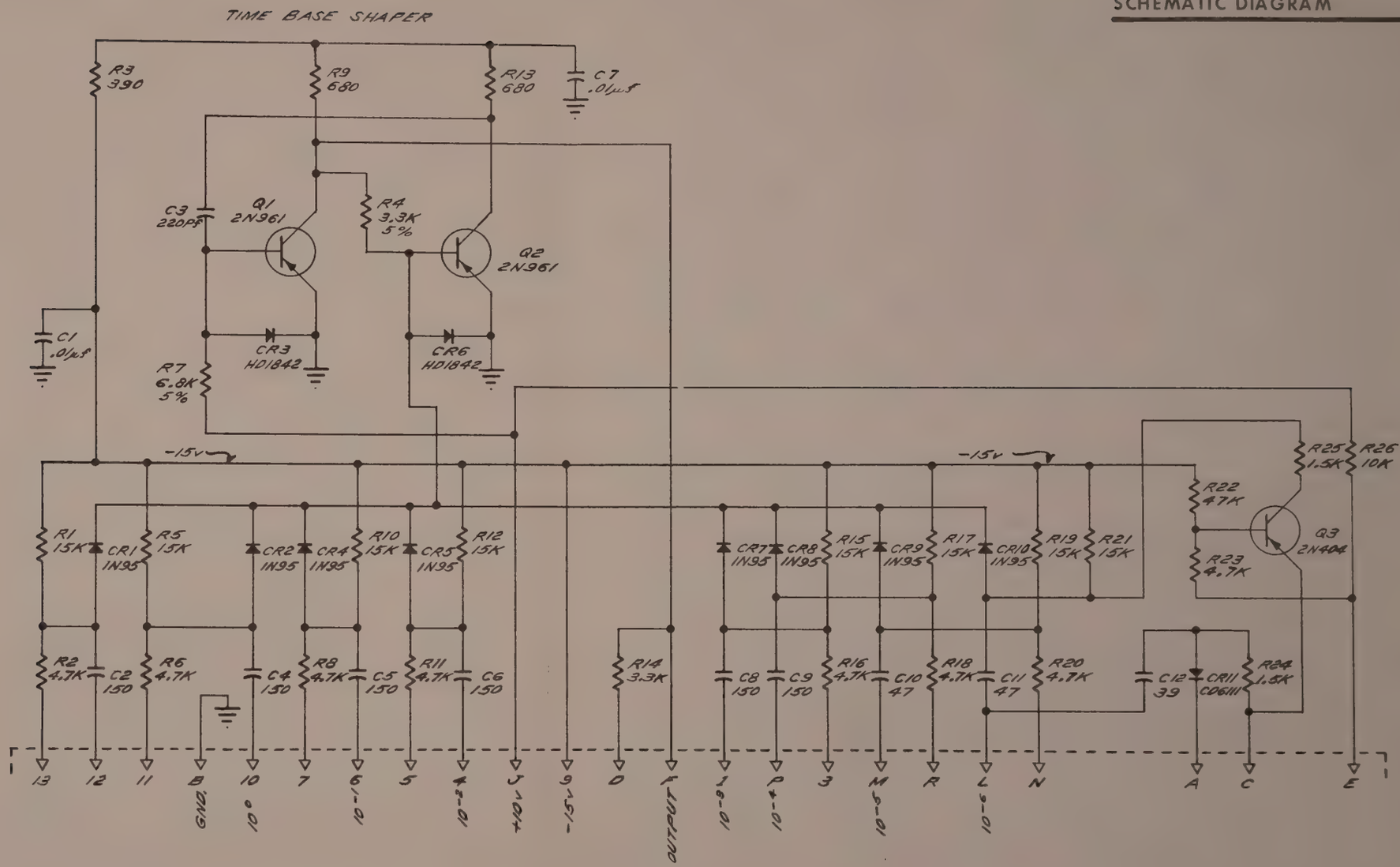
1) RESISTORS:
   WATTAGE — 1/2 W., UNLESS NOTED.
   TOLERANCE — 10%, " "
2) CAPACITORS:
   CAPACITY — IN PF, " "
   VOLTAGE — 300 v, " "
   TOLERANCE — 5%, " "
3) .01 µf DISC ARE −20 +80%, 500v.
4) * — DIODES ARE TO BECKMAN SPEC. DWG. A755-4043593.
5) ** — TRANSISTOR TO BECKMAN SPEC. DWG. A755-4100066.
6) ALL TRANSISTORS ARE 2N404, UNLESS NOTED.
7) DS1 — IS TO BECKMAN SPEC. DWG. A825-4143355.

MODELS:
6124, 6144, 6126
6146, 6127, 6147
D411909-Rev. E
February 1966

Beckman®

Lot 5+

MODEL 6100 SERIES
TIME BASE LOGIC
SCHEMATIC DIAGRAM



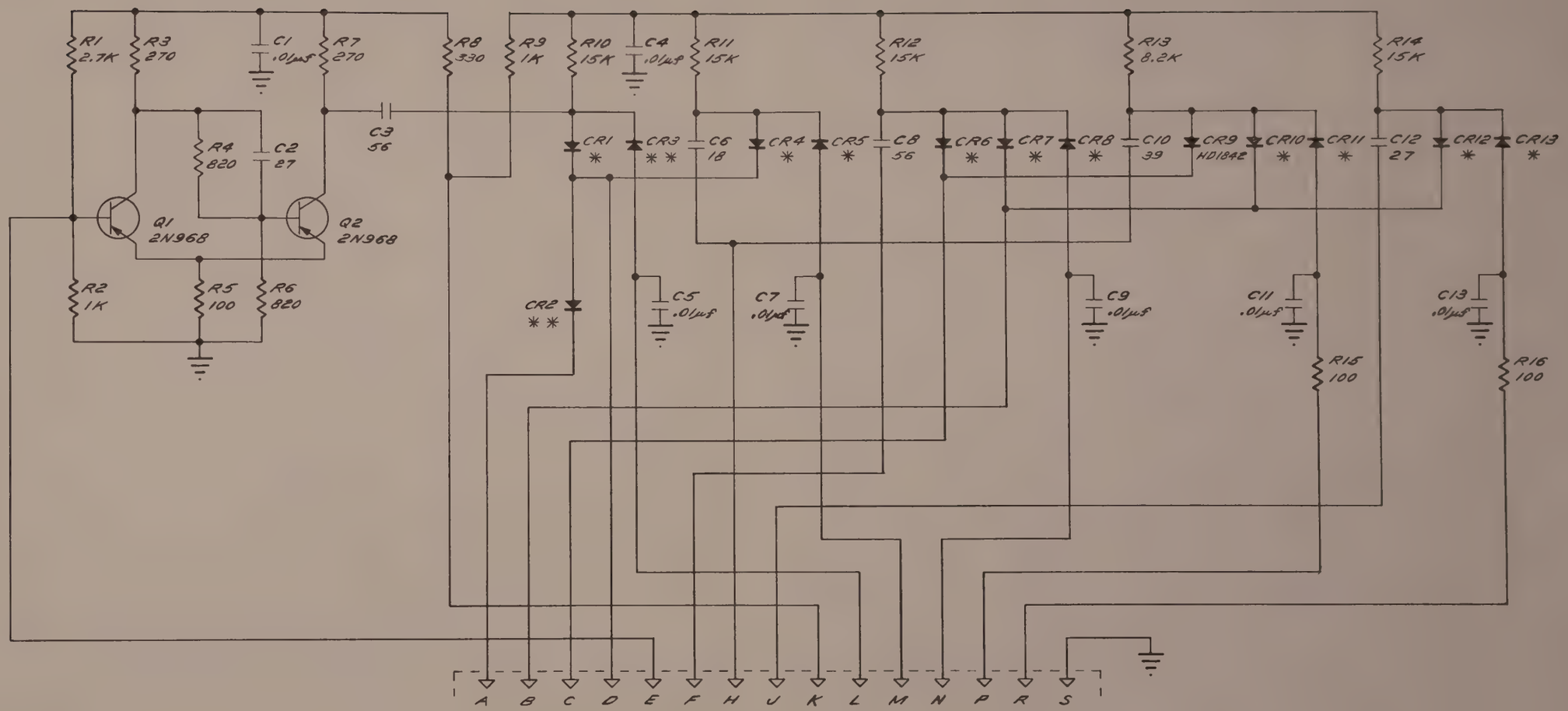
NOTE:

1) RESISTORS:
   - WATTAGE ——— 1/4W, UNLESS NOTED.
   - TOLERANCE — 10%, " "
2) CAPACITORS:
   - CAPACITY ——— INPf, " "
   - VOLTAGE ——— 300v, " "
   - TOLERANCE — 5%, " "
3) .01µf DISC ARE -20+80%, 500v.

MODELS:
6124, 6144, 6126,
6146, 6127, 6147
C 411897 - Rev. C
November 1963

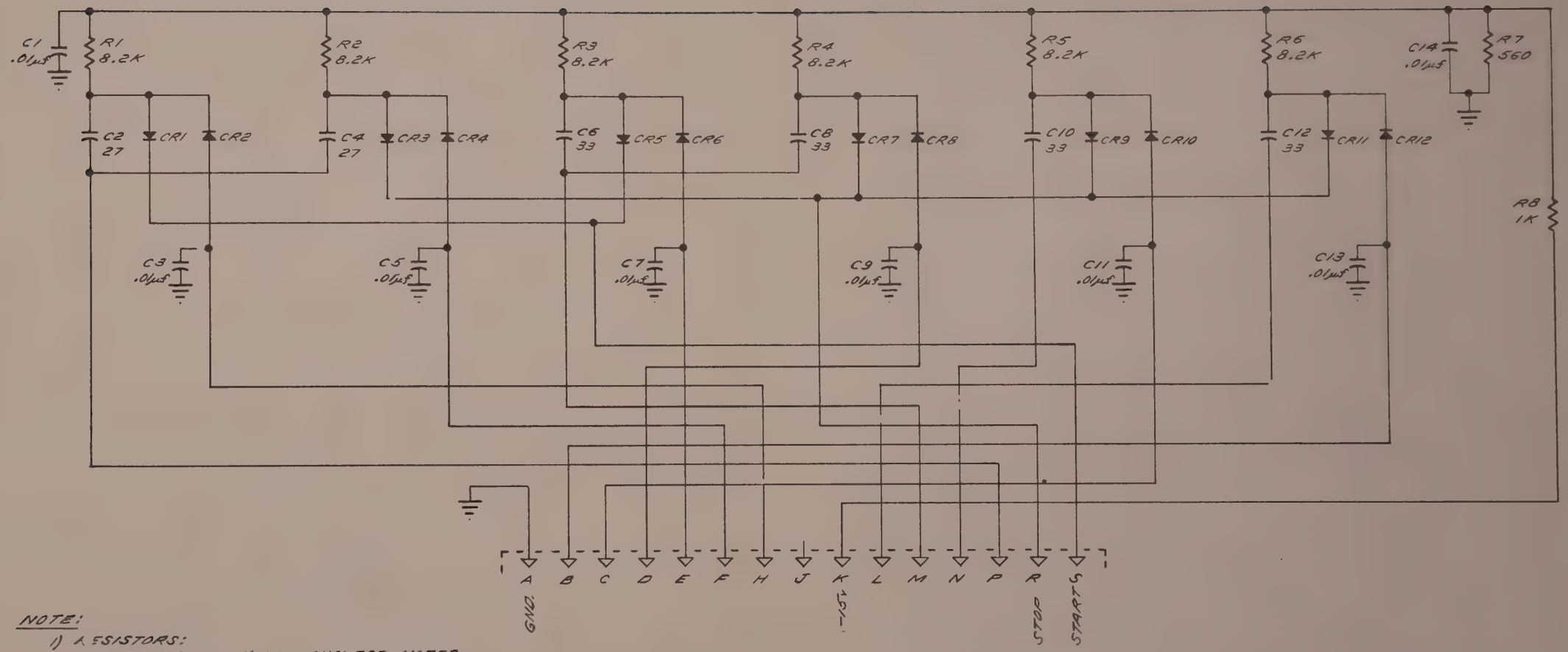
Beckman

P. C. Board Lot 2+



NOTE:

1) RESISTORS:
   WATTAGE —— 1/4 W., UNLESS NOTED.
   TOLERANCE — 5% , " " .
2) CAPACITORS:
   CAPACITY —— IN PF , " " .
   VOLTAGE —— 300v. , " " .
   TOLERANCE — 5% , " " .
3) .01μf DISC ARE -20+80%, 50v.
4) * — DIODES ARE TO BECKMAN SPEC.
   PART Nº 755-815561.
5) ** — DIODES ARE TO BECKMAN SPEC.
   PART Nº 755-828597.

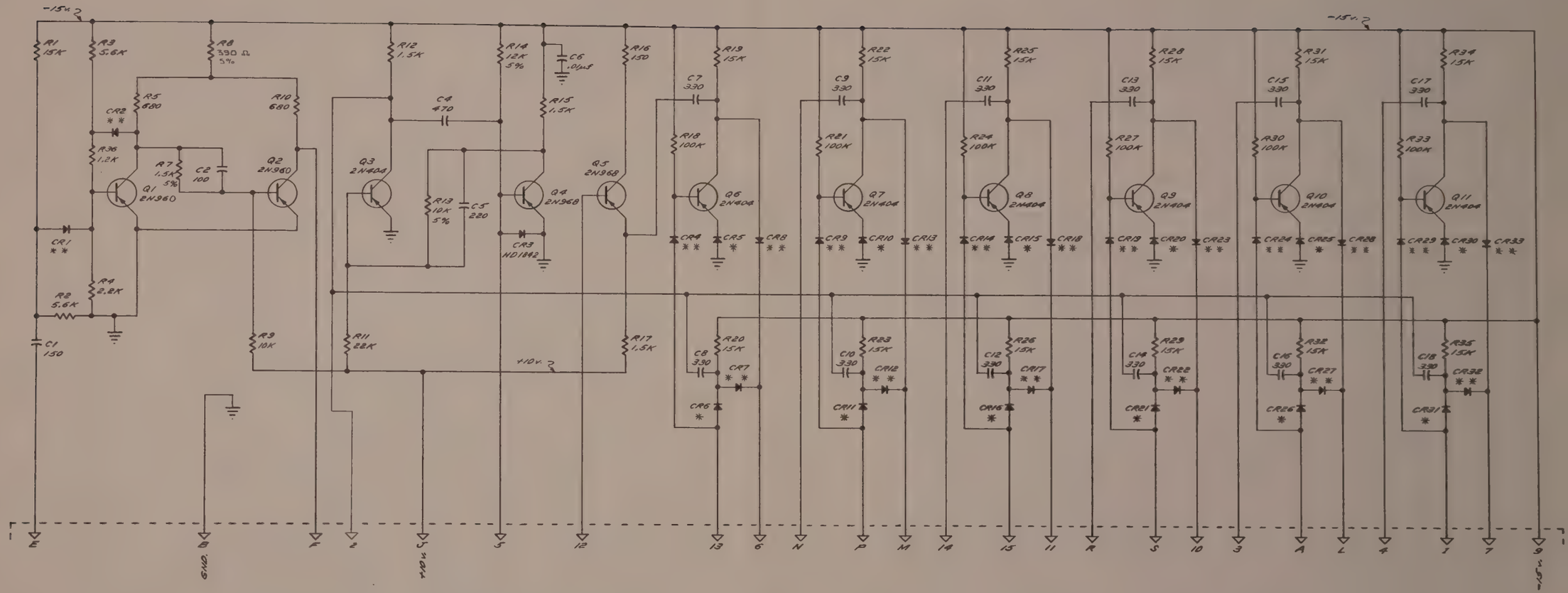


NOTE:

1) RESISTORS:
   WATTAGE —— 1/4 W. ; UNLESS NOTED.
   TOLERANCE — 5% , " " .
2) CAPACITORS:
   CAPACITY — IN Pf ; " " .
   VOLTAGE —— 300 v. ; " " .
   TOLERANCE — 5% , " " .
3) .01μf DISC ARE -20+80%, 50v.
4) ALL DIODES ARE HUGHES HD1842.

Beckman

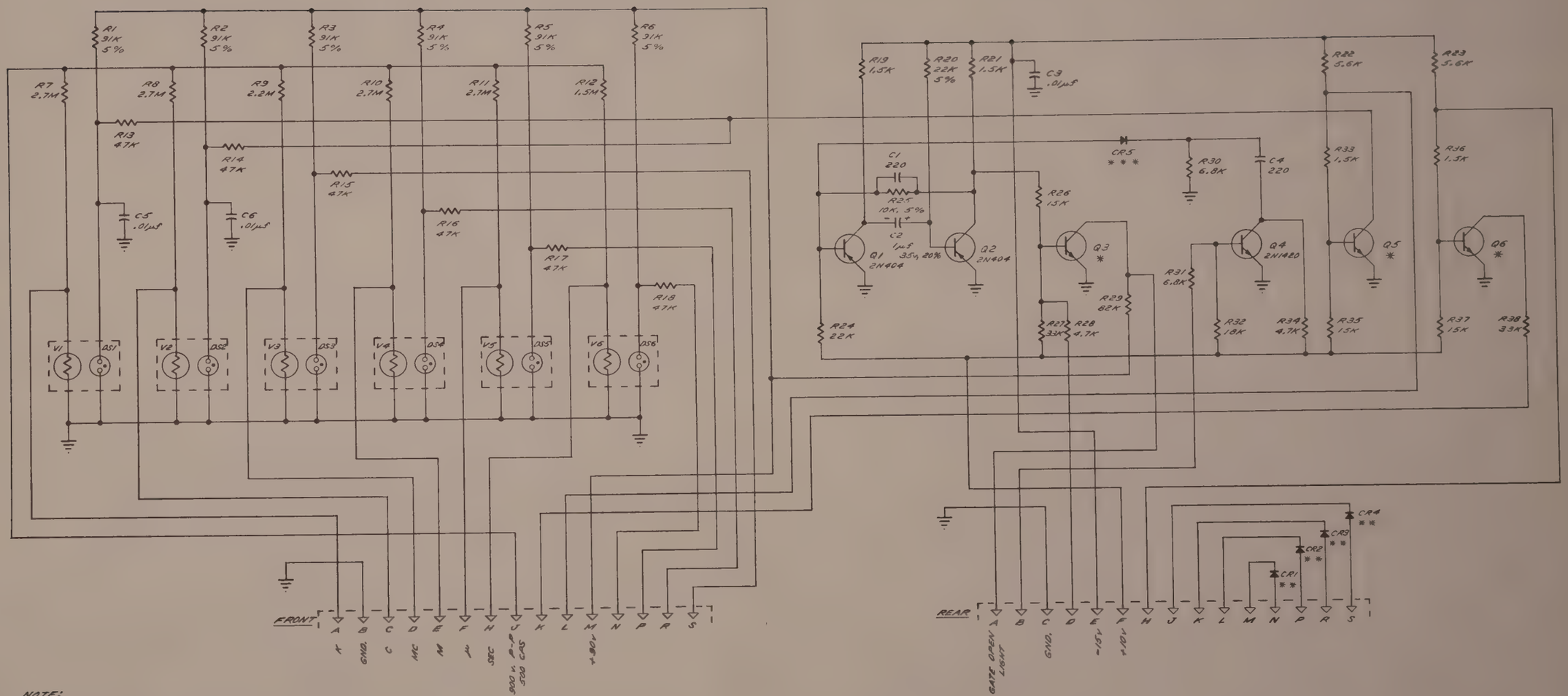
MODELS 6127 & 6147
"M" LOGIC
SCHEMATIC DIAGRAM



NOTE:

1) RESISTORS:
   WATTAGE —— 1/2 W., UNLESS NOTED.
   TOLERANCE — 10%, " " .
2) CAPACITORS:
   CAPACITY —— IN PF, " " .
   VOLTAGE —— 300 V., " " .
   TOLERANCE — 5 %, " " .
3) .01μF DISC ARE -20+80%, 50V.
4) * - DIODES ARE TO BECKMAN SPEC. DWG. A755-404393.
5) ** - DIODES ARE TO BECKMAN SPEC. DWG. A755-402107.

MODELS 6127 & 6147
LEGEND
SCHEMATIC DIAGRAM



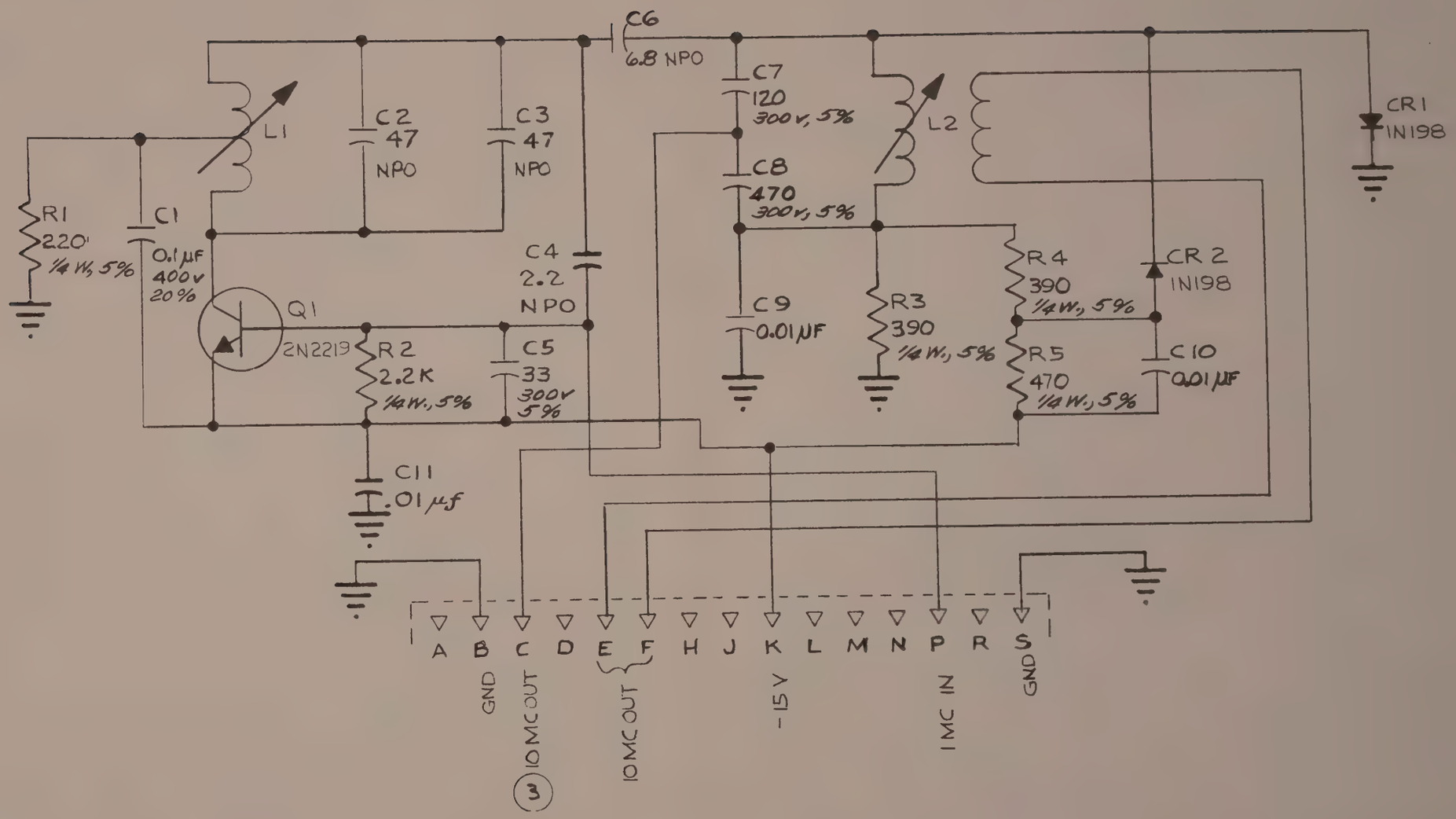
NOTE:

1) RESISTORS:
   WATTAGE —— ¼ W., UNLESS NOTED.
   TOLERANCE —— 10 % , " " .
2) CAPACITORS:
   CAPACITY —— IN P.F., " " .
   VOLTAGE —— 300 V. , " " .
   TOLERANCE —— 5 % , " " .
3) .01μf DISC ARE -20+80%, 500 V.
4) ALL NEON BULBS ARE TO BECKMAN SPEC. DWG. A885-414955. (DS1 THRU DS6)
6) ALL PHOTORESISTORS ARE TO BECKMAN SPEC. DWG. A753-416278. (V1 THRU V6)
7) * — TRANSISTORS ARE TO BECKMAN SPEC. DWG. A755-410066.
8) * * — DIODES ARE TO BECKMAN SPEC. PART № 755-813561. (CD6111)
9) * * * — DIODE TO BECKMAN SPEC. DWG. № A755-404393.

MODELS 6127 & 6147
D 418073 - Rev. A
November 1963

Beckman

MODEL 6100 SERIES
1-10 MC MULTIPLIER
SCHEMATIC DIAGRAM



NOTE:

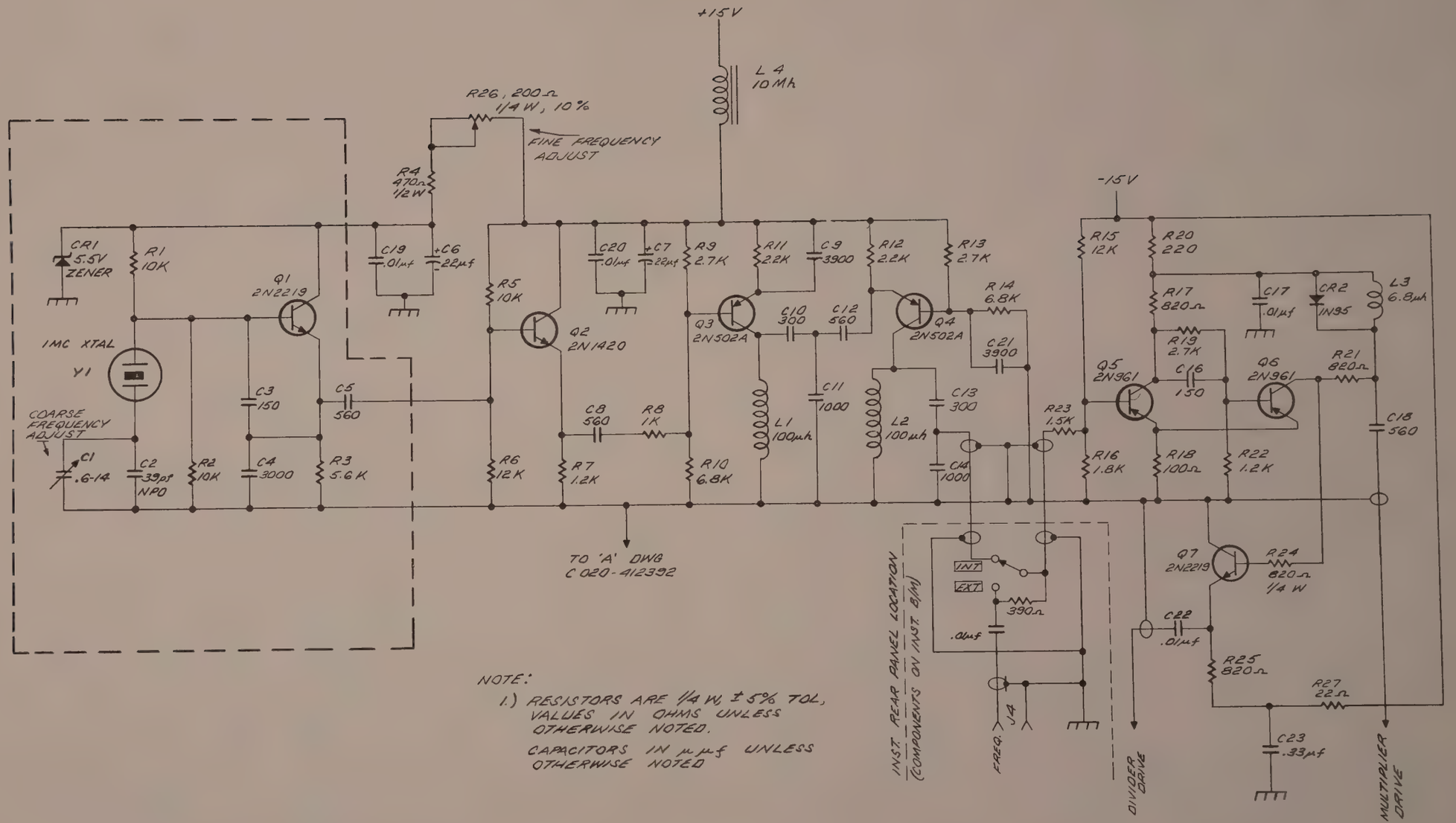
1) CAPACITORS:
   CAPACITY —— IN Pf, UNLESS NOTED.
   VOLTAGE —— 600v, " " .
   TOLERANCE — 10 %, " " .
2) 0.01µf DISC ARE -20+80%, 500v.
(3) TO DRIVE COUNT GATE CIRCUITRY.

MODELS 6126, 6146,
6127 and 6147
B 411803 - Rev. A
November 1963

Beckman®

P. C. Board Lot 2+

MODEL 6100 SERIES
1 MC PRECISION OSCILLATOR
SCHEMATIC DIAGRAM



NOTE:

1.) RESISTORS ARE 1/4 W, ± 5% TOL, VALUES IN OHMS UNLESS OTHERWISE NOTED.

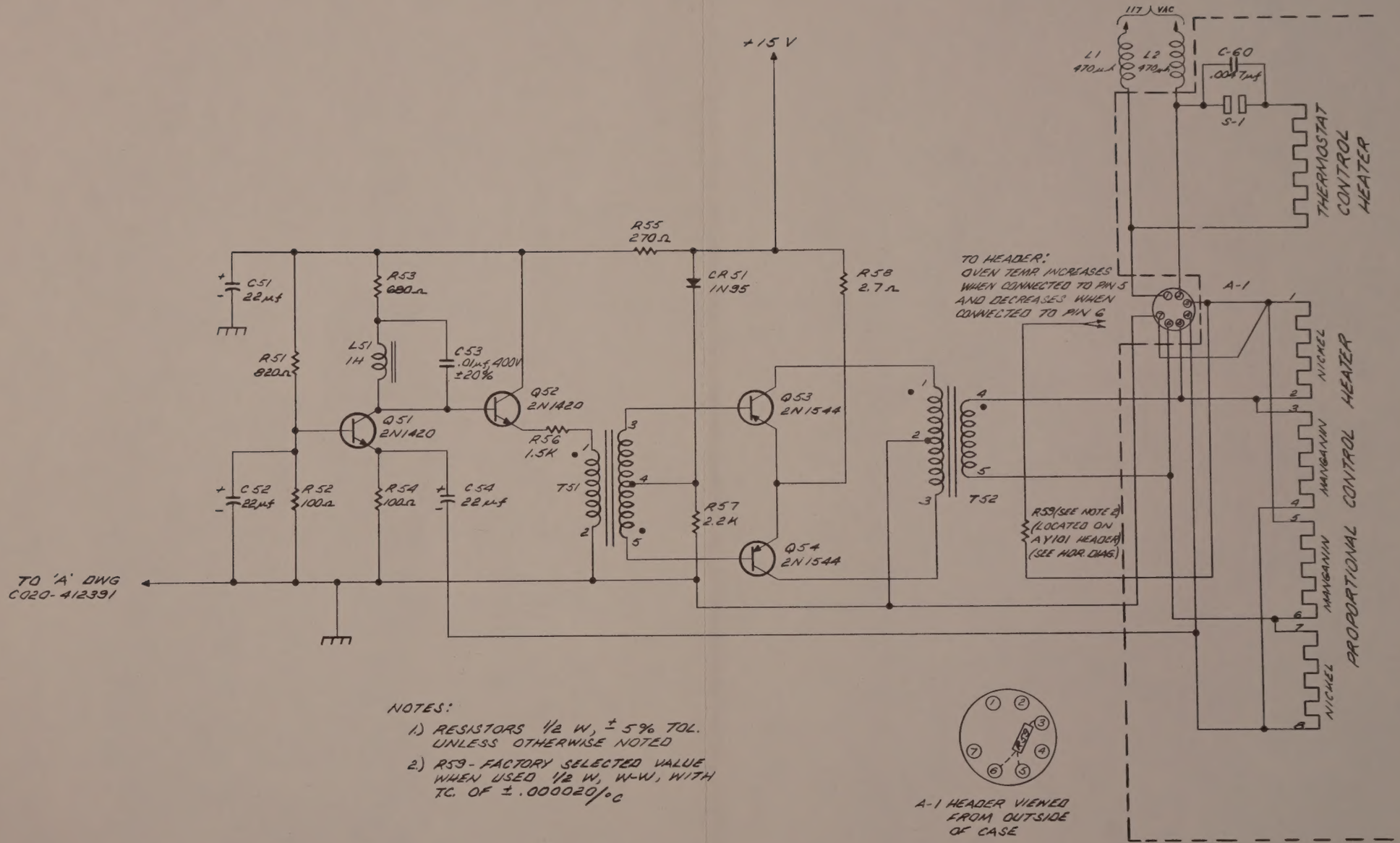
CAPACITORS IN μμf UNLESS OTHERWISE NOTED

MODELS 6126, 6146,
6127 and 6147
C 412391 - Rev. C
November 1963

Beckman®

Lot 2+

MODEL 6100 SERIES
1 MC PRECISION OSCILLATOR
OVEN CONTROL
SCHEMATIC DIAGRAM



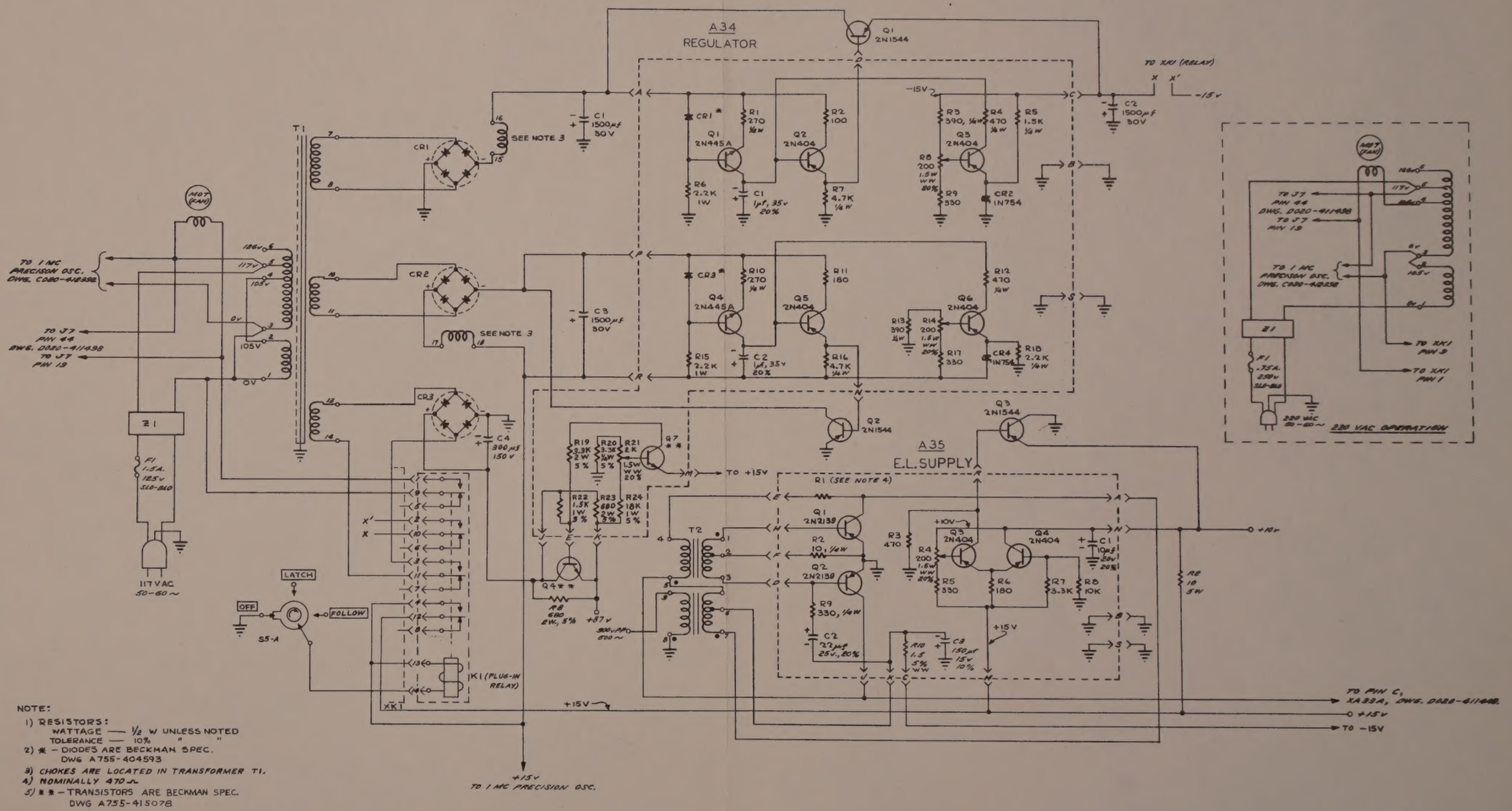
NOTES:

1) RESISTORS 1/2 W, ± 5% TOL. UNLESS OTHERWISE NOTED
2) R59 - FACTORY SELECTED VALUE WHEN USED 1/2 W, W-W, WITH TC. OF ± .000020/°C

A-1 HEADER VIEWED FROM OUTSIDE OF CASE

MODELS 6126, 6146
6127 & 6147
C412392-Rev. D
February 1964
Beckman®
Lot 4+

MODEL 6100 SERIES
POWER SUPPLY
SCHEMATIC DIAGRAM



NOTE:

1) RESISTORS:
   WATTAGE — 1/2 W UNLESS NOTED
   TOLERANCE — 10% " "
2) * - DIODES ARE BECKMAN SPEC. DWG A755-404593
3) CHOKES ARE LOCATED IN TRANSFORMER T1.
4) NOMINALLY 470 Ω
5) ** - TRANSISTORS ARE BECKMAN SPEC. DWG A755-415078

MODELS:
6124, 6144, 6126
6146, 6127, 6147
D411974-Rev. I
February 1964

Beckman®

Serial 200+